THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA

A Series of case studies

Vol. 1 Financing Entrepreneurial Ventures

(stages, uses, & sources)

Manitoba
Industry, Trade
and Technology

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TABLE OF CONTENTS

	Foreword	2
1	Introduction	5
2	ABI Biotechnology Inc.	9
	The Case Study	10
	Exhibits	17
	Teaching Note and Practitioner Guide	30
3	Homestead Computer Services Ltd.	35
	The Case Study	36
	Exhibits	48
	Teaching Note and Practitioner Guide	66

FOREWORD

ABOUT THE SERIES

Technological change is effecting the Manitoba business community in ways only dreamed of less than a generation ago. New, modern, technological innovations are being introduced at unprecedented rates. Increasingly, continuing entrepreneurial competitiveness seems dependent on the ability and willingness of individual businesses to identify and capitalize on technological innovations, and to adapt work methods, procedures, and operations to such innovations.

Recognizing the positive challenges inherent in identifying and assimilating technology into general use, the Technology Division of the Department of Industry, Trade and Technology, and the University of Manitoba, through the Faculty of Administrative Studies, cooperatively developed a series of Manitoba-based case studies addressing the management of technological change. The purpose for this joint venture was to foster awareness of technological innovations among business practitioners and business students, as well as to assist organizations manage technological change.

The series titled "THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA" comprises four volumes:

Vol. 1, Financing Entrepreneurial Ventures (stages, uses, & sources)
Cases: ABI Biotechnology Inc.
- financial crisis in raising development funding
- early stages of technological entrepreneurial ventures

Homestead Computer Services Ltd.
- strategies for long-term company growth: market development, new product selection
- financing long-term company growth

Vol. 2, Marketing Technological Products (processes, issues, & problems)
Cases: Sota Electronics Corporation
- developing a new technological product
- marketing a new technological product

Wintec Electronic (A)
- developing a new technological product
- reviewing R & D priorities
- marketing strategy

Wintec Electronic (B)
- production automation: analysis of marketing potential, cost effectiveness and expansion alternatives

Vol. 3, Worker Adjustment (managerial dilemmas, staff relations, and changing job functions)

Cases: Canadian Agricultural Services Limited
- impact of automation on staff relations
- impact of automation on job functions

Prairie Grain Producers
- managerial dilemmas and automation: fundamental problems and their effects on organizations from managerial perspective

Vol. 4, Automation: Robotics and Office Information Systems

Cases: Versatile Farm Equipment Company CAD/CAM System
- remaining competitive through automation
- acquiring a CAD/CAM system: factor and strategic analyses

Mid-West Garments Apparel Corporation
- reasons and conditions for considering new technologies
- importance of open-minded corporate attitudes

Quality Electrical Fixtures & Supplies Inc.
- management issues re: making effective use of information technology

The Technology Division had an editorial function in preparing these volumes

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ABOUT THE CASE STUDY METHOD

A case study is a sample of a real life situation; in this instance, a real life business situation. As a method of learning and teaching, the case study affords a unique opportunity for technological entrepreneurs, business practitioners, and business students to develop a better, perhaps fuller, understanding of a business situation which is of immediate or long-term concern to them. Through case study analysis and debate, as well as exposure to the experience and opinions of other entrepreneurs, practitioners, and students, participants learn several ways of looking at, thinking about and acting in a particular business situation. Hence, through indepth examination and diagnosis of situations comparable to their own, improved guides to action may be developed. (Reference: International Labour Office. (1972). An Introductory Course in Teaching and Training Methods for Management Development. Geneva: ILO Publications).

ABOUT THIS VOLUME

This volume comprises two case studies -- ABI Biotechnology and Homestead Computer Services Ltd. Taken together, these two cases can be used to illustrate some principles involved in the financing of entrepreneurial ventures. ABI Biotechnology illustrates a company that is in the very early stages of development and is attempting to raise the initial capital required to fund its activities. Homestead Computer Services illustrates a company that has raised initial capital in two stages and is now contemplating how it will finance its next stage of development.

The volume is primarily meant for two audiences, as follows:

1. Business practitioners seeking to secure funding for technological entrepreneurial ventures. Such practitioners may be associated with newly-formed companies or long-established ones.
2. Business students who are in the process of learning about possible stages, uses, and sources of funding for technological entrepreneurial ventures.

The volume is intended for use in a variety of settings. For example, a business entrepreneur, together with other key members in his/her organization, may elect to review the case studies as part of their decision making process regarding the financing of an innovative, new project. Business consultants could also use the volume as real-life subject material for technology seminars. Similarly, business educators could use the case studies to stimulate the thinking of their students.

ABOUT THE ORGANIZATION OF THE VOLUME

The volume is organized into three major sections. Section 1 introduces the learning objectives and reviews some of the important concepts of venture financing; Section 2 presents the ABI Biotechnology case study in its entirety; Section 3 similarly presents the Homestead Computer Services Ltd. case study. Each section is further divided into two parts: the case study itself including exhibits and/or appendices, and the teaching note and practitioner guide.

Section 1

INTRODUCTION TO
VOLUME 1: FINANCING ENTREPRENEURIAL VENTURES

INTRODUCTION[1]

As mentioned in the Foreword, the two cases -- ABI Biotechnology Inc. and Homestead Computer Services Ltd. -- can be used together to illustrate some principles involved in financing of entrepreneurial ventures. ABI Biotechnology illustrates a company that is in the very early stages of development and is attempting to raise the initial capital required to fund its activities. Homestead Computer Services illustrates a company that has raised initial capital in two stages and is now contemplating how it will finance its next stage of development.

Objectives

As a package, these cases can be used to meet the following objectives:

1. To understand the different stages of funding required for entrepreneurial ventures.
2. To understand the different uses of funds at different stages of entrepreneurial venture funding.
3. To understand the different sources of funding available to firms.
4. To understand how different sources of funds are appropriate for different stages of development of the entrepreneurial venture.
5. To understand what will make an investor view an investment as "successful".

Important Concepts in Venture Financing

Going back to basics for a moment, the financing for an innovative new project or company requires funding in stages. These, in general, include seed funding, development funding, start-up funding and establishment funding. Seed funding is required to do the initial investigation of the potential venture in order to decide whether and how to proceed. Development funding is required to move the idea to a commercially developed product or service and to do initial market development (i.e. market research, distribution network, pricing, promotion, etc.). Start-up funding is required to move the developed product or service from its prototype stage into the market on a commercial basis. Money may be required to finance plant and equipment, work in process, inventory, marketing activities, etc. Establishment funding is required to finance ongoing product or service improvements, included in inventories, accounts receivable, additions to plant and equipment, etc., as the business moves ahead to achieve its full market volume potential.

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[1] The Introduction to this volume was prepared under the supervision of Dr. Brian Owen.

Potential sources of funds for the four stages of development normally include equity funds, earnings or profits retained in the business, or borrowed funds (either short term or long term). To these traditional sources of funds can be added direct or indirect government grants.

Not all sources of funds are appropriate at all stages. At the two early stages of seed and development funding there will be no internally generated profits or retained earnings available for the new entrepreneurial company, although profits generated from other products may be an available source of funds for established, successful companies.

Debt financing is not normally available, nor is it an attractive source of funds for the entrepreneur or entrepreneur (innovator in a larger organization) needing seed or development funding.

This leaves the innovating entrepreneur or entrepreneur who has no access to internal company sources of funds, and with only equity as a traditional source of funds. Another option, much talked about by the struggling innovator, is direct or indirect government aid.

For a moment, let us examine the availability of equity as a source of funds for companies working on projects at the front end of the innovation chain. As most innovators will not have sufficient funds to finance their ventures themselves they will have to approach outside equity investors.

In order to obtain financing for the first two stages of an innovative project from outside equity capital sources, two conditions appear necessary. First, there must exist a pool of capital that can potentially be available and, second, the prospective investors must perceive a potential for an appropriate return on their investment.

There seems little doubt that there is a potentially available pool of capital in Canada if returns are perceived as appropriate. The volume of money that was attracted by the SRCT "quick flips" is testimony to the fact that money is available for R & D if the return is perceived as appropriate. Also there are numerous examples of companies that have successfully raised "seed and development" funding and have gone on to substantiate success. This brings us to the second condition, which is a perceived potential for an appropriate return on capital. If there were no government programs to enhance or even guarantee a return on investment, the investor or the inventors' advisers would base their assessment of a project's potential upon factors such as: the viability and attractiveness of the business concept in relation to the market opportunity; the reputation, experience, ability and commitment of the key individuals involved in the project; the viability of the business plan for applying the resources available to the innovators to the market opportunity; and (particularly for any subsequent funding) the achievement of successful early results.

Emphasis by the entrepreneur, who wants to attract funding at the early stages of a project, should, therefore, be upon improving the quality of understanding of the market, attracting highly competent people to the venture; developing a reasonable, workable business plan; and ensuring that early results achieved are as good as or better than anticipated in the business plan.

The key to finding funding at the later stages of the project (i.e. for start-up and establishment funding) is to have a proven record of success in the earlier stages. If it can be established that the product, or service, is technically feasible and that the market potential does look very promising, then funds can be attracted. At these stages a wider variety of sources of funds is available. The prospects for borrowing money (and the ability to repay it) improve, particularly at the establishment stage. Also the potential for internal funding from profits becomes available, particularly at the establishment stage.

A key assessment factor for investors is cash flow projections for how much return they will receive and when they will receive it.

One very important consideration that will be in the minds of investors prior to committing funds for later stages of a project, however, will be the success achieved to that point in time. Early success in a project will be regarded as success in its own right, but it will also be considered in terms of how likely the company's project will be to succeed in the future. A positive record of past success in key areas will give much more credibility to projections of future financial results.

Section 2

CASE STUDY:

ABI BIOTECHNOLOGY INC.

ABI BIOTECHNOLOGY INC.[1]

Be or Not to Be

"Gentlemen, we have a problem." On December 26, 1984 this comment was, perhaps, the understatement of the year. ABI Biotechnology of Winnipeg, Manitoba, was facing more than a problem; they were facing a crisis which could result in the death of the infant company before it even had a chance to prove itself.

Industry Background

Biotechnology is the utilization of a biological process, via microbial, plant, animal cells or their constituents, to provide goods and services. Contrary to popular opinion, biotechnology did not arrive with the space age. For centuries mankind has exploited biological processes, through the techniques of fermentation, to produce alcoholic beverages, develop new foods and to detoxify human and animal waste. Common twentieth century advances include the production of vaccines, antibiotics, vitamins and steroids.

In recent years, spectacular advances in cellular and molecular biology, biochemistry, microbial genetics, and biochemical engineering have greatly magnified the range of applications to which biological processes can be directed. Specifically, two major techniques which have been developed have opened the way for new solutions to old problems.

1. Genetic Engineering

Genetic engineering, or recombinant DNA, involves taking a fragment of DNA (deoxyribonucleic acid) from a source cell (of a plant, animal, microrganism or chemical synthetics) and splicing it into a DNA fragment from another organism (often the common intestinal bacterium, E.Coli). The resulting hybrid is inserted back into the E. Coli cell and reproduced in a culture (i.e., cloned). As DNA contains the genes of the cells, or the

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[1] This case was prepared by B. Vuschau and J. Paisley under the supervision of Dr. Brian Owen, as a basis for classroom discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Copyright by The Case Development Program Faculty of Management, University of Manitoba. Support for the development of this case was provided by Manitoba Industry, Trade and Technology.

genetic material which contains the blueprint for reproduction, the new organisms now have the ability to produce new proteins along with the old. In effect it is like cutting a printed page in half, inserting a new paragraph in the middle, and photocopying the altered version over and over to reproduce the new material with the old. The most dramatic achievement of the technique, to date, was developed at Genentech, Inc. Their scientists endowed E. Coli bacteria with synthesized human insulin genes. The bacteria responded by making the human protein, insulin.

2. Cell Fusion

Cell fusion is exactly what the name implies. It is the fusion of two different cells from an organism. The resulting cell, called a hybridoma, has the characteristics of both of the original cells. For example, an antibody-producing cell of a mouse can be fused with a particular mouse tumor cell. The new cell can divide indefinitely like cancer cells, and can produce antibodies like the antibody-producing cell. The result is a cell which has the staying power to produce the antibody continuously, i.e., monoclonal antibodies. This technique can also be used to fuse plant cells which result in hybrid plants. Ultimately, this might lead to plants which exhibit faster growth, greater disease and climatic resistance and overall, more advantageous characteristics.

The American Experience

While the Canadian biotechnology industry is just emerging from a wide scattering of research activity in university and government laboratories[2], the American industry is much more advanced. American companies have moved from exploring a wide range of technologies to the pursuit of specific projects which are marketable. A prime example is Genentech, Inc. which stuck to a specific plan for developing marketable hormones. Genentech developed human insulin through genetic engineering. The insulin was marketed under the trade name Humulin in 1982. Like many other R & D companies, however, Genentech was unable to reap the largest portion of the benefits from the marketing of Humulin. Lacking manufacturing and marketing facilities, Genentech sold the license for producing and marketing Humulin to the Eli Lilly Pharmaceutical Company. The sale of the license demonstrated that biotechnology was commercially feasible, but also served to illustrate how a research company might not receive the full financial benefits of their invention.

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[2] Biotechnology Task Force Report, Biotechnology: A Development Plan for Canada. Ottawa: Minister of Supply and Services Canada, 1981, No. St 31-9/1981E.

ABI

ABI went from a dream to a reality in less than six months. In December, 1983, Dr. Bert Friesen joined by Reg Ebbeling approached Dr. H.G. Friesen, a member of the Canadian Federal Task Force on Biotechnology. With his support, a Scientific Advisory Committee was formed to obtain ideas and to develop the company.

By the spring of 1984, the Scientific Advisory Committee, had been structured to consist of three exceptionally qualified, committed scientists. Murray Palay, who specialized in securities, became the company's lawyer and the basic structure of the company had been determined.

Because of the considerable difficulties involved in funding a non-profit R & D company, ABI was incorporated on June 22, 1984 for the purpose of undertaking and promoting research in the field of biotechnology, with a view to developing commercial applications of the research. The Company planned to undertake research, farm out research on a contract basis, and purchase and fund research in other entities. The revenues from contract research and the sale or licensing of research, if any, would provide funding for further researach. One Class B Common Share was issued to Dr. B. Friesen for $1.00.

In July, Dr. Lou Melosky joined the Board of Directors, and the company set out to acquire seed capital. During August 1984, ABI (through a series of SRTC "quick flips")[3], issued promissory notes for $400,000. Within 24 hours ABI paid back $240,000, leaving $160,000 to be used for research.

In addition, the company transferred their research tax credits (which amounted to 50 percent of the original $400,000 or $200,000), to the purchasers of the notes. ABI emerged from the transaction with $160,000 for seed capital and a tax liability of $200,000. The "investors" ended up with $240,000 cash, and tax credits worth $200,000.

In September, ABI rented an office and obtained an option on land in a Fort Garry Industrial Park near the University of Manitoba. A refundable deposit of $10,000 held the option on the $180,000 property until January 15, 1985. An extension was available to April 1, 1985, but $5,000 of the deposit became non-refundable. Plans for an 8,000 square foot building were developed. The majority of the space was designated as research laboratories. If a production facility was required at a future date, it would be constructed on the same lot as there was ample space for expansion.

(See Exhibit 2)

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[3] SRTC's are described in Exhibit 1

The Advisory Committee

ABI's Scientific Advisors were an exceptional group. Dr. H.G. Friesen, a Professor at the University of Manitoba, Faculty of Medicine, had expertise in the field of endocrinology. Dr. Jay was a specialist in molecular biology, who had been with the Department of Medical Microbiology at the University of Manitoba since 1980. Dr. C.M. Wong was a specialist in new anti-cancer drug development. Dr. Wong had already been involved in the development of anti-cancer drugs which were to be marketed by Farmitalia. Dr. Wong was a Professor of Chemistry at the University of Manitoba. These three scientists were to consult and advise ABI on its research and development projects.

ABI Projects

ABI planned to learn from the American experiences. They identified specific projects with market potential, and intended not only to develop the products, but to produce and market them, thus reaping the entire benefits of the company's research.

ABI chose four projects to be undertaken as money became available. Of the four, two had potential for short-term commercial value and two had long-term potential commercial value. Due to the highly competitive nature of the industry, the specific projects are closely guarded secrets which could not be revealed even to shareholders. It was known, however, that the projects fell in the following categories.

1. Genetic Engineering -- for the purpose of agricultural applications.
2. Monoclonal antibodies -- for the purpose of:
   (a) diagnostic kits
   (b) therapeutic use
3. Subunit Vaccines and Synthetic Vaccines -- for the purpose of developing new or improved vaccines, e.g., Western Equine Encephalitis.
4. Anti-Cancer Drugs -- for the purpose of developing new or improved drugs, which would:

   (a) have an increased potency with a decreased toxicity, and

   (b) increase the suppression of the human rejection mechanism (for transplants) while decreasing the suppression of the general immune system.

Market Potential

While the size of the market for ABI's products could not be estimates for some competitive products, could be indicative of the size of the market specifically determined, the case writer felt that sales figures and market potential available to ABI. Following are a few examples by product category:

1. Agricultural Applications

A joint venture company formed by Diamond Shamrock Corp. (Dallas Tx.) and Showa Denko (Tokyo, Japan) had over $200 million in sales (1984) of agricultural chemicals.[4] Meanwhile, Genex Corp. (Rockville, MD.) was working on a genetically engineered antigen which partially protected chickens from coccidosis, a disease that cost the poultry industry $300 million a year.[5]

2. Monoclonal Antibodies and Vaccines

By May 1985, Genentech (San Francisco, CA.) joined Genetics Institute (Boston, MA.), Biogen (Cambridge MA.), Chiron (Emeryville,CA.) and Integrated Genetics (Framingham, MA.) in the race to capture a portion of the estimated $200 million per year world wide market for Factor VIII (a blood protein which is missing or defective in victims of hemophilia A). Serono Diagnostics Inc. (Boston, MA.) entered the diagnostic kit market. Serono was a subsidiary of the Ares-Sorono Group which had sales of approximately $110 million from the development and marketing of diagnostic and pharmaceutical products. Ventrex Laboratories, Inc., (Portland, ME.) produced a serum-free media used to produce monoclonal antibodies and microcarriers for vaccine production.

Under a distribution agreement with a Japanese company, Ventrex entered the $60 million Japanese market for cell culture media. The potential market (1985) in the U.S. for this synthetic media was estimated by analysts to be $10 million.[9]

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[4] "SDS Biotech Partners to Split", Biotechnology News, 5, No. 10 (1985), p.3

[5] "Genex Emphasized New Projects", Biotechnology News, 5, No. 10 (1985), p.3.

[6] "Genentech Clones and Expresses Factor VIII," Biotechnology News, 4, No. 9 (1984), p. 1

[7] "Batelle to Develop Diagnostic Instruments for Serono, " Biotechnology News, 5, No. 1 (1985), p. 4

[8] "Ventrex Labs Signs Deals; Expands Product Lines", Biotechnology News, 5, No. 1 (1985), p. 6.

[9] "Activities at a Glance", Biotechnology News, 5, No. 1 (1985), p. 11.

3. Anti-Cancer Drugs

Farmitalia had two new anti-cancer drugs which would replace the current drug Adriamycin. Adriamycin had a marketable value of more than $120 million U.S. per year. A study by SRI International (Menlo Park, CA.) examined the world wide market for immunotropic agents for the treatment of cancer, infectious diseases, allergies, arthritis, and other diseases. They predicted a market of between $1.5 and $2 billion by 1990, which could possibly explode to between $16 and $22 billion by the end of the century.[11]

Apparently, all four project areas held enormous sales and profit potential, but equally, all four areas contained strong competition.

Going Public

The company was well established on paper. Now it needed to raise the money necessary to start the research as well as acquire the land and construct the building. It was decided to do this by going public. On November 13, 1984, ABI issued a prospectus (Exhibit 3), seeking a maximum of 5000 units from investors.

Each unit consisted of 1,000 Class A Common Shares with the right to SRTC's. The price was $1,000 per Unit, and the minimum purchase was set at five units. The offering had a maximum of 5,000 Units and a minimum of 1,600 Units. Failure to achieve the minimum by December 31 would result in the funds being returned to the investors without interest or deduction.

To make the share offering more attractive to investors, ABI had offered Scientific Research Tax Credits. The Canadian market, however, was experiencing heavy competition in the area of issues offering some form of tax credit.

ABI could not assure its investors that neither income tax laws and regulations nor current administrative practices of the federal tax authorities would not be changed or interpreted in a manner which would affect the tax consequences for subscribers of the share issue.

Unlike the "quick flips" an SRTC share had to be regarded as a long-term investment. Research and development involves significant risk and there was no assurance that any of the projects undertaken by ABI would be commercially successful. The ultimate success of the corporation would depend on its ability to licence or sell its technology to others. In addition there was no market for the Class A Common Shares and there was no assurance that a market would develop. Subscribers, however, were not personally liable for the liabilities of the corporation. Their risk was limited to their capital contribution.

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[10] Company Prospectus

[11] "Market for Immunotropics May Hit $22 Billion", Biotechnology News, 4, No. 9 (1984), P. 4

The business plan submitted to the Manitoba Securities Exchange Commission stated that the proceeds of the issue would be used as indicated in Exhibit 4.

The effect a large influx of capital would have on the financial position of the company is shown by the Pro Forma Balance Sheet (Exhibit 5).

Decision Situation

By December 24, 1984 only $700,000 of the issue had been subscribed for. This was below the $1.6 million stated in the prospectus. Dr. Bert Friesen called a meeting of the new Directors, the company lawyer and the accountant for 8:00 p.m. on December 26.

The choice was stated simply. "Either we come up with a new business plan which calls for a reduced minimum of $800,000 so that we can close, or the money we have received so far is returned, and we try again next year. If we decide to go for a new plan, it will have to be developed tonight (December 26) in order to get it approved by the Manitoba Securities Exchange Commission. It will be close. The Commission isn't open on Monday the 31st, which means we would have to get approval by the 28th, in two days. If we failed in the attempt, we would likely lose investors' confidence for any future issue. Should we go for it?"

Consequences of Alternatives

The choices, and consequences of the choices, facing the company appeared to be as follows:

1. ABI could refrain from doing anything. In that case, it was almost a certainty that the minimum shares would not be purchased by the closing date. Failure to close would result in all money being returned to investors, whose only loss would be the foregone interest. ABI's financial position would not change, except for the money spent in offering the issue. They could try again next year.

2. ABI could withdraw the issue. The result would be the same as alternative (1), only the action would be voluntary.

3. ABI could attempt to revise their business plan so that a minimum of 800 units ($800,000) was called for. The new plan would have to be approved by the Manitoba Securities Exchange Commission prior to the deadline. If the approval could be obtained, the offering would be closed. ABI would have a record of a successful offering and money to commence research. Such a record would be a benefit if another issue was offered at a future date. Failure to obtain approval on time would be the same as following alternative (1). Time was the major factor.

EXHIBITS:

ABI BIOTECHNOLOGY INC.

Exhibit 1

Scientific Research Tax Credits

The Scientific Research Tax Credit (SRTC) program was introduced by the federal government on January 19, 1984. Originally, SRTC's were created as a means of encouraging Canadian investment in research and development, while at the same time helping firms that might not otherwise be able to use additional tax incentives.

A big feature of SRTC's was a "flow through mechanism" whereby a new or fledgling company wishing to engage in research, could transfer R & D tax credits to an investor. The research company would then have a tax liability equal to the amount of the tax credit turned over to the investor. In other words, assuming a 50 percent corporate tax rate, the R & D company would have to do $100 worth of research in order to reduce its tax liability by $50. The research firm would do this by renouncing $50 worth of tax deductions for every $100 worth of research work done.

Investors soon devised a "quick flip" scheme which allowed them to make an immediate profit. They began to demand a "bonus premium" or "commission" of five to ten percent, before agreeing to provide funds to companies for R & D purposes. For example: an investor would provide a firm with $100. In return, the firm would give back $50 cash, a form transferring $50 worth of R & D tax credits, and a "bonus premium" of $10. Stated another way, the "investor" would end up with $60 cash and a $50 tax credit; and the firm would be left with $40 cash (to be used for research), and a future tax liability of $50.

From the beginning, these quick flips proved to be extremely popular with investors, who were able to make a quick five or ten percent profit with no risk. The SRTC's also helped research-oriented firms (such as ABI), to raise otherwise difficult to obtain seed capital.

Problems arose when some newly-funded, but not always well-managed R & D firms ran into financial difficulty and were unable to do enough research to pay their outstanding tax liabilities. Also, because so many investors took advantage of the scheme to reduce their taxes, the federal and provincial governments found that their income tax revenue was being reduced by an amount many times greater than initially forecast. As a result, on October 11, 1984, the federal Minister of Finance imposed a moratorium on SRTC's banning quick flips and requiring investors to receive shares instead of cash for their investment in research and development companies.

The moratorium had the effect of causing investors to look more closely at the companies in which they were investing, and in the process made it much more difficult for "unknown" firms to raise funds for research and development. Also contained in the moratorium was a grandfather clause which allowed previously arranged or "in process" quick flip deals to proceed under the old rules.

By November 1984, competition was keen for R & D seed capital. With no risk quick flips effectively banned, investors were reluctant to finance the research and development projects of junior companies. In addition, no guarantees could be made as to the future of the SRTC program. It was conceivable that the government might further amend the rules or even cancel SRTC's altogether. It was under these conditions that ABI approached the market for additional funds.

EXHIBIT 2*

ABI BIOTECHNOLOGY INC.
(Incorporated under the laws of Canada)

BALANCE SHEET AS AT SEPTEMBER 30, 1984

ASSETS

Cash	$ 143,772
Income tax recoverable (note 2)	200,000
Deferred scientific research costs	8,228
Deposit on land (note 3)	10,000
Incorporation costs	1,074
	$ 363,074

LIABILITIES

Accounts payable	$ 573
Income tax payable (note 2)	200,000
Advances from shareholder	2,500
Deferred scientific research credits (note 2)	160,000
	363,073

SHAREHOLDER'S EQUITY

Capital stock (note 4)	
1 Class B common share	1
	$ 363,074

Subsequent events (note 5)

Approved by the Board

Director

Director

*Source: Company Prospectus.

EXHIBIT 2

ABI BIOTECHNOLOGY INC.

STATEMENT OF CHANGES IN FINANCIAL POSITION

FROM INCORPORATION ON JUNE 22, 1984 TO SEPTEMBER 30, 1984

CASH DERIVED FROM		
Issuance of 1 class B common share		$ 1
Issuance of promissory notes		240,000
Deferred scientific research credits		160,000
Advances from shareholder		2,500
Increase in accounts payable		573
		403,074
CASH APPLIED TO		
Redemption of promissory notes	$ 240,000	
Deposit on land	10,000	
Deferred scientific research costs	8,228	
Incorporation costs	1,074	259,302
CASH AT END OF PERIOD		$ 143,772

EXHIBIT 2

ABI BIOTECHNOLOGY INC.

NOTES TO FINANCIAL STATEMENTS

SEPTEMBER 30, 1984

1. ACCOUNTING POLICIES

(a) Basis of accounting

The activities of the company are in the development stage. All costs have been capitalized and therefore no statement of income is provided.

(b) Deferred scientific research costs

Deferred scientific research costs will be charged to income when the company commences active operations.

(c) Deferred scientific research credits

Deferred scientific research credits will be credited to income on a pro rata basis as related expenditures on scientific research are incurred and charged to income.

2. SCIENTIFIC RESEARCH INCOME TAX CREDITS

During the period ended September 30, 1984 the company received $400,000 in exchange for promissory notes and scientific research tax credits, designating the $400,000 for the benefit of the lenders under the provisions of the Income Tax Act relating to Scientific Research Tax Credits. As a result of the designation the company has incurred an income tax liability of $200,000. These income taxes are recoverable at the rate of $1 for every $2 of qualified research and development expenditures incurred by the company.

The promissory notes were redeemed for $240,000. The balance of $160,000 is shown as deferred scientific research credits.

3. DEPOSIT ON LAND

The company has made an offer to purchase a parcel of land in Whyte Ridge Industrial Park, Winnipeg. The purchase price is $180,000 payable as follows

Deposit	$ 10,000
Payable on closing	170,000
	$ 180,000

The deposit is refundable should the company not proceed with the purchase.

EXHIBIT 2

ABI BIOTECHNOLOGY INC.

NOTES TO FINANCIAL STATEMENTS

SEPTEMBER 30, 1984

4. CAPITAL STOCK

(a) The company is authorized to issue unlimited numbers of class A common shares and class B common shares.

(b) At the discretion of the directors of the company, class B common shares representing a maximum of 25% of the issued and outstanding voting shares may be issued as incentives to directors, management, research scientists and scientific advisors of the company. The class B common shares will be subject to a voting trust agreement and will be voted as a class in accordance with the terms of the agreement.

5. SUBSEQUENT EVENTS

(a) Subsequent to September 30, 1984 the company intends to amend its Articles of Incorporation as follows

(i) Public offerings of shares are to be permitted.

(ii) The class B common shares are to be convertible into class A common shares on a share-for-share basis.

(iii) The class B common shares will be entitled to one vote for every three outstanding class A common shares.

(b) The company has commenced proceedings to raise capital by way of a public offering of 5,000,000 class A common shares. The offering price is $1 per share and it is the company's intention to designate that amount for the benefit of the purchasers under the provisions of the Income Tax Act relating to Scientific Research Tax Credits.

EXHIBIT 3

No Securities Commission or similar authority in Canada has in any way passed upon the merits of the securities offered hereunder and any representation to the contrary is an offence

New Issue

November 13, 1984

ABI BIOTECHNOLOGY INC.

$5,000,000.00

Issue of up to 5,000 Units
Each unit consists of 1,000 Class A Common Shares
with right to Scientific Research Tax Credits

The Corporation will undertake scientific research with the proceeds of this public offering and once scientific expenditures are incurred will be entitled to claim certain scientific research tax credits ("SRTCs") pursuant to the provisions of Section 127.3 and Part VIII of the Income Tax Act (Canada) (the "ITA"). The Corporation will have renounced the benefit of the SRTCs on the issuance of the Units and will designate for the benefit of the purchaser of a Unit the full amount of the purchase price of a Unit pursuant to Subsection 194(4) of the ITA. The first registered holder of Class A Common Shares that is an individual or corporation shall be entitled to claim an SRTC against tax otherwise payable: see TAX ASPECTS OF OFFERING.

PRICE: $1,000 per Unit

MINIMUM PURCHASE 5 UNITS ($5,000.00)

We, R.I.S. EQUITIES INC. as agents, conditionally offer these Units on a "best efforts" basis, subject to prior sale, if, as and when issued and delivered by the Corporation and accepted by us in accordance with the conditions contained in the Sales Agent Agreement referred to under "Plan of Distribution" and subject to the approval of all legal matters on behalf of the Corporation by Buchwald Asper Henteleff, Winnipeg, Manitoba.

These securities are speculative.

There is no market through which the Class A Common Shares may be sold. The Class A Common Shares are not suitable for investors who may have to liquidate their investment on a timely basis and therefore investment in the Class A Common Shares should be considered only by those investors who are able to make a medium to long term investment. Investors should consider the merits and risks of the investment in addition to the income tax benefits.

Prospective investors of Class A Common Shares should consult their own professional advisors in order to assess income tax, legal and other aspects of an investment in Class A Common Shares.

Class B Common Shares representing a maximum of 25% of the issued and outstanding voting shares of the Corporation may be issued at the discretion of the board of directors of the Corporation at any time as incentives to management, directors, research scientists and Scientific Advisors of the Corporation. The issuance of Class B Common Shares will have the effect of diluting the interests of holders of Class A Common Shares to a maximum of 25%.

	Price to Public	Sales Commission	Net Proceeds to Corporation (1)
Per Unit	$ 1,000	$ 70	$ 930
Minimum Purchase	5,000	350	4,650
Minimum Offering	1,600,000	112,000	1,488,000
Maximum Offering	5,000,000	350,000	4,650,000

(1) Before deducting estimated expenses of issue of $250,000 payable by the Corporation.

(2) This offering is subject to a minimum subscription being received by the Corporation by December 31, 1984. Funds received will be held by MONTREAL TRUST COMPANY OF CANADA as Escrow Agent and if this minimum subscription is not achieved by December 31, 1984, funds will be returned promptly to investors without interest or deduction.

Subscriptions for Units will be received subject to rejection or allotment in whole or in part and the right is reserved to close the subscription book without notice. The Closing Date shall be on or before December 31, 1984. It is expected that certificates evidencing the Class A Common Shares will be available for delivery within six weeks of the Closing Date. Confirmation of the acceptance of a subscription will be forwarded to the subscriber promptly after closing. The Corporation is not obligated to accept any subscription.

EXHIBIT 4*

USE OF PROCEEDS

The net proceeds to the Corporation from the sale of the Units issued by the Corporation are estimated to be a maximum of $4,400,000 and a minimum of $1,340,000 after deducting the Corporation's estimated expenses of issue and the Agents' selling commissions. Subject to the Escrow Agreement these proceeds will be added to the Corporation's working capital and will be used for research and development projects as follows:

	Maximum Subscription 5,000 Units	Minimum Subcription 1,600 Units	Expected Research Period
Land and Building (1)	730,000	730,000	
Genetic Engineering Project (2)	1,270,000	)	5 years
		) ONLY	
Monoclonal Antibodies Project (2)	900,000	) ONE	2-3 years
		) PROJECT	
Synthetic Vaccines Project (2)	600,000	) WILL	1-2 years
		) BE	
		) UNDERTAKEN	
Anti-Cancer Drug Project (2)	900,000	) $ 610,000	2-3 years
		)	
Sales Commissions	350,000	112,000	
Expenses of Issue (3)	$ 250,000	$ 148,000	
Total:	$5,000,000	$1,600,000	

(1) Land in the approximate amount of $180,000 is not a qualified expenditure for SRTC purposes.

(2) Projects are inclusive of operating expenses, overheads and equipment purchases. Expected disbursements:

(a) Administration - 20%;
(b) Equipment and Supplies - 30 - 50%; and
(c) Research salaries - 45 - 50%.

(3) If expenses of issue are paid from the proceeds of this Offering, there will be an additional $100,000 available from the proceeds of the issuance of redeemable promissory notes: See Prior Transactions. The expenses of issue are estimated to be $100,000 plus 3% of the proceeds.

*Source: Company Prospectus.

EXHIBIT 5*

ABI BIOTECHNOLOGY INC.
(Incorporated under the laws of Canada)

PRO FORMA BALANCE SHEET AS AT SEPTEMBER 30, 1984

ASSETS

Cash	$ 4,693,772
Income tax recoverable (note 3)	2,700,000
Deferred scientific research costs	8,228
Deposit on land (note 4)	10,000
Incorporation costs	1,074
	$ 7,413,074

LIABILITIES

Accounts payable	$ 573
Income tax payable (note 3)	2,700,000
Advances from shareholder	2,500
Deferred scientific research credits (note 3)	2,660,000
	5,363,073

SHAREHOLDERS' EQUITY

Capital stock (note 5)	
5,000,000 Class A common shares	2,500,000
1 Class B common share	1
	2,500,001
Deficit, costs of issuing class A common shares	450,000
	2,050,001
	$ 7,413,074

Subsequent event (note 6)

Approved by the Board

Director

Director

*Source: Company Prospectus.

EXHIBIT 5

ABI BIOTECHNOLOGY INC.

NOTES TO PRO FORMA BALANCE SHEET

SEPTEMBER 30, 1984

1. ACCOUNTING POLICIES

(a) Basis of accounting

The activities of the company are in the development stage. All costs have been capitalized and therefore no statement of income is provided.

(b) Deferred scientific research costs

Deferred scientific research costs will be charged to income when the company commences active operations.

(c) Deferred scientific research credits

Deferred scientific research credits will be credited to income on a pro rata basis as related expenditures on scientific research are incurred and charged to income.

2. PRO FORMA ASSUMPTIONS

The pro forma balance sheet gives effect to the following transactions as if they occurred September 30, 1984.

Issuance of 5,000,000 class A common shares for cash	
Amount credited to share capital	$ 2,500,000
Amount credited to deferred scientific research credits	2,500,000
	$ 5,000,000
Payment of agent's commission	$ 350,000
Payment of estimated costs of issue	100,000
Income tax liability incurred as a result of designating scientific research tax credits to purchasers of shares	2,500,000
Income taxes recoverable at the rate of $1 for every $2 of qualifying scientific research expenditures incurred	2,500,000

EXHIBIT 5

ABI BIOTECHNOLOGY INC.

NOTES TO PRO FORMA BALANCE SHEET

SEPTEMBER 30, 1984

3. SCIENTIFIC RESEARCH INCOME TAX CREDITS

During the period ended September 30, 1984 the company received $400,000 in exchange for promissory notes and scientific research tax credits, designating the $400,000 for the benefit of the lenders under the provisions of the Income Tax Act relating to Scientific Research Tax Credits. The company intends also to designate the $5,000,000 proceeds of the issue of class A common shares under the same provision. As a result of the designations the company incurs an income tax liability of $2,700,000. These income taxes are recoverable at the rate of $1 for every $2 of qualified research and development expenditures incurred by the company.

The promissory notes were redeemed for $240,000. The balance of $160,000, together with $2,500,000 of the proceeds from the issue of class A common shares, are shown as deferred scientific research credits.

4. DEPOSIT ON LAND

The company has made an offer to purchase a parcel of land in Whyte Ridge Industrial Park, Winnipeg. The purchase price is $180,000 payable as follows

Deposit	$ 10,000
Payable on closing	170,000
	$ 180,000

The deposit is refundable should the company not proceed with the purchase.

5. CAPITAL STOCK

(a) The company is authorized to issue unlimited numbers of class A common shares and class B common shares.

(b) Class A common shares

Proceeds of issue	$ 5,000,000
Amount allocated to deferred scientific research tax credits	2,500,000
	$ 2,500,000

(c) At the discretion of the directors of the company, class B common shares representing a maximum of 25% of the issued and outstanding voting shares may be issued as incentives to directors, management, research scientists and scientific advisors of the company. The class B common shares will be subject to a voting trust agreement and will be voted as a class in accordance with the terms of the agreement.

EXHIBIT 5

ABI BIOTECHNOLOGY INC.

NOTES TO PRO FORMA BALANCE SHEET

SEPTEMBER 30, 1984

6. SUBSEQUENT EVENT

Subsequent to September 30, 1984 the company intends to amend its Articles of Incorporation as follows

(i) Public offerings of shares are to be permitted.

(ii) The class B common shares are to be convertible into class A common shares on a share-for-share basis.

(iii) The class B common shares will be entitled to one vote for every three outstanding class A common shares.

Section 2

TEACHING NOTE & PRACTITIONER GUIDE

ABI BIOTECHNOLOGY INC.

ABI BIOTECHNOLOGY INC.

Teaching Note and Practitioner Guide

Synopsis

As of December 1984, ABI is a company facing a crisis in the early stages of raising development funding. The company principals have raised seed capital and have the conceptual framework of an organizational strategy. The case also briefly mentions how they raised the initial seed capital for the organization.

Objectives of the Case

1. To consider the assessment of potential for growth in a venture.
2. To consider how to assess the concept of how a business is to be undertaken.
3. To consider how to develop a business plan for a new venture.
4. To consider the importance of government tax concessions for raising funds for entrepreneurial ventures.
5. To consider the importance of showing success in fund raising.
6. To understand a technological entrepreneurial venture in its very early stages.

Questions

Questions to consider in analyzing ABI include:

1. What is the environmental opportunity, as it relates to the potential for future revenue growth for ABI?
2. What is ABI's strategy? What is ABI's business plan?
3. What role has the SRTC program played for ABI, and what value has it?
4. What implications has proceeding or not proceeding with the fund raising issue for the credibility of ABI?
5. What risks are involved in the venture?
6. What is the environmental opportunity, as it relates to potential for future revenue growth for ABI?

Analysis

1. WHAT IS THE ENVIRONMENTAL OPPORTUNITY, AS IT RELATES TO POTENTIAL FOR FUTURE REVENUE GROWTH FOR ABI?

The section on market potential allows the reader to get a feeling for the magnitude of the potential opportunity for a firm like ABI. Although there is no estimate of market potential by company management the nature of opportunity available for areas such as agriculture, anti-bodies and vaccines and anti-cancer drugs suggests a very, very major market potential.

The areas mentioned all have companies in the hundred million dollar range, market opportunities estimated in the tens or hundreds of millions of dollars, or even projected markets in the multi billion dollar range as in the case of anti-cancer drugs.

It would definitely appear that a very major market opportunity is available if the company can effectively develop products that have appeal to one or more of these developing markets. It gives a feeling for how exciting this area must be to its entrepreneurial management group. It would also appear that there are a number of emerging companies at this stage in this industry. Eventually the leading firms may come to dominate the industry but at this point in time there is potential for a variety of types of firms, including ABI, to eventually become dominant in the industry.

2. WHAT IS ABI'S STRATEGY?

Although there is little detail provided about the specific ABI approach to the industry, sufficient information is provided to enable the reader to gain a notion of what their approach will be.

The company intends to research and develop products for general areas. These were, genetic engineering for the purpose of applications, monoclonal anti-bodies, vaccines and synthetic vaccines, and anti-cancer drugs.

The company intended to develop the products and then produce and market them. They intended to use the money raised from the share issue to establish a research facility which would be used for development of the products. As the products were developed, they would be marketed to the industry sources. This strategy is different than that of a company that might choose only to do contact research and development for other organizations that sought to develop products. It's also different than the strategy of companies that sought only to produce or market a product and not participate in research and development activity.

3. WHAT IS ABI'S BUSINESS PLAN?

There is no explicit business plan outlined in the case. However, it should be possible for the reader to develop a plan for the company. The plan should include such factors as:

- Expenditures for various research projects - some hints on this can be gleamed from Exhibit 4 which is extracted from the company prospectus.
- Money for land.
- Money for laboratory facilities.
- The research and development budget for each of a series of years.
- The projections for revenues for each of a series of years.
- The manpower resources required.
- Some financial projections can be seen in the prospectus material in the exhibits.

4. WHAT ROLE HAS THE SRTC PROGRAM PLAYED FOR ABI, AND WHAT VALUE HAS IT?

It is interesting to discuss the importance of a vehicle like the SRTC. You might consider how likely it would be that money could have been raised by the company without the government SRTC program. It is probably also useful to look at Exhibit 1 to see some of the details of how the scientific research tax credit program functions.It is quite unlikely that the company would have been successful in raising the money they did without the aid and assistance of SRTC's.

5. WHAT IMPLICATIONS DOES PROCEEDING OR NOT PROCEEDING WITH THE FUND RAISING ISSUE HAVE FOR THE CREDIBILITY OF ABI?

It is interesting to contemplate the effect on ABI of not proceeding to close the issue even though they have not raised the full amount of money they had hoped for. It can be argued that it would be a mistake to try to close without raising the full amount of money because this would make it very difficult for them to achieve their research objectives and at the same time would make it very difficult for them to succeed with their long-term plans. On the other hand, it can be argued that for them to not proceed would damage their credibility as a company going to the market to raise money. This means that if they did refund the money to investors when they went to the market subsequently they may not get these same people to commit their money again.

The discussion should probably consider how likely it is that they will be coming back to the market for funding in the future and how likely they would be to get an additional five to ten million dollars if they decided to withdraw their offer at this point in time.

6. WHAT RISKS ARE INVOLVED IN THE VENTURE?

It is quite obvious that this is a high-rise venture. One should appreciate the competition that ABI is up against, and the fact that although there is a remarkable large potential, the market does indeed require development. For ABI to be successful, they must develop good technical products, convince the market that their products are superior in marketability, and be able to consistently manufacture and supply a high quality product. There are many major tasks to be undertaken and obstacles to be overcome before this company achieves a high level of commercial success. On the other hand, if they are successful, the rewards available to them are quite substantial.

Conclusion

As with many business decisions, there are no clear cut right or wrong answers, and the decision taken will depend to a large extent on the risk-taking mentality of those involved. What is important is that entrepreneurs learn to consider all factors carefully, rather than making purely intuitive decisions in haste, and that they be aware of the stages and sources of funding for entrepreneurial ventures. Readers may be interested to know what did happen.

ABI did go ahead and revise its prospectus and settle for the $700,000 that had been collected to December 26th. Subsequently they went back to the market in April 1985 and raised an additional 4 million dollars. The SRTC program was important in raising this additional money.

Company management felt that it had been very important for them to push ahead in December. They said it was "very, very important". The feeling was that their credibility was enhanced by going ahead and being "careful, honest and open in this dealing as they had been in all others."

There was a feeling that it is absolutely important to be able to show success in operations in order to continue raising funds. The statement was "money gets more money and success gets more success." The feeling as of April 1986 was that they had not yet reached the point where they were able to claim great market and technical success. Their original projection in their prospectus and business plan was that it would take five years in order to get to a point of market success.

The feeling was that they will have to keep raising money, therefore, they will have to continue showing success. In the summer of 1986 they will be employing 15 - 20 people in various research projects. They are working out of a rented facility of about 7,000 square feet in an industrial park near the University of Manitoba.

An observation respecting fund raising was that it is very important to work with certain key people like knowledgeable accountants and lawyers.

An opinion of company management was that straight equity is very hard to raise. The existence of some type of government sweetener, like the SRTC, is quite important.

Section 3

CASE STUDY:

HOMESTEAD COMPUTERS SERVICES LTD.

HOMESTEAD COMPUTER SERVICES LTD.[1]

In late November 1985, Sheldon Fulton, President of Homestead Computer Services Ltd., was preparing for a meeting with his executive committee to discuss the company's long-term growth strategy. During its short six year history, Homestead had grown to become one of North America's largest suppliers of microcomputer software for farm applications, and had annual sales of just under $3 million.

Despite their relatively quick growth, Mr. Fulton felt the company had reached a plateau. He was concerned about continued market development, selection of new products and how to finance future growth, to enable the company to move from $3 million in sales into the $10-$20 million range. The job, he knew, would be a challenging one, but with the help of his team of talented young executives, he was confident it could be done.

The Agricultural Software Industry

Between 1979-1985, the agricultural software industry in North America experienced considerable upheaval. In 1979 there were fewer than a dozen firms producing microcomputer software catering specifically to the agriculture sector. As more entrepreneurs realized the potential of this market, the number of ag-software firms proliferated, peaking at an estimated 350 by 1984. Due to a depressed economy, a general reluctance of farmers to adopt computer technology, and a simple overabundance of companies in the market, many of these firms went out of business or consolidated. By 1985 the number of firms had declined to about 150 and this figure was expected to drop under 100 in the near future, with less than ten dominating the market.

These rapid changes resulted in a shift in the industry structure. What began as a "cottage industry" characterized by many small companies with one or two people writing programs in their basements, had evolved into a much more capital intensive industry with a few larger firms. The following

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[1] This case was prepared by J. Paisley under the supervision of Dr. Brian Owen,and Dr. Ross Henderson as a basis for classroom discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Copyright by The Case Development Program, Faculty of Management, University of Manitoba. Support for the development of this case was provided by Manitoba Industry, Trade and Technology.

[2] Homestead Management Systems Inc. - company files 1985

table lists the strongest competitors producing farm management software as of early 1985.

Company	Market Share
Harris Technical Systems (U.S.A.)	8 - 10%
Red Wing Business Systems (U.S.A.)	5 - 10%
Farm Business Systems (U.S.A.)	5 - 10%
Homestead Computer Services (Canada)	3 - 5%

Microcomputer Technology on the Farm

In the United States and Canada, approximately 3 percent of the nations' large commercial farms (i.e. farms with over $100,000 gross annual income), used computers in their farm businesses. In Canada there were approximately 80,000 farms of over $100,000 sales. In 1985, this represented about 10,000 installed microcomputer systems in the U.S. Contrary to earlier predictions, farmers had been very slow to accept the new technology. Only innovative producers and a handful of "early adopters" used computers with ag software to assist in their farm operations. Nevertheless, the future looked bright for the farm computer and software industry.

According to a 1985 study by Chase Econometrics, the number of large commercial farms in the United States was expected to increase by an annual rate of 6 - 7 percent over the next ten years. Coupled with this, a number of signs pointed towards more rapid adoption of microcomputer technology on the farm, namely:

- Farmers were becoming better educated, and most agricultural colleges offered computer courses.

- Microcomputers and software were becoming more "user friendly" and less expensive.

- Farm lending institutions began demanding better record keeping and more complete financial statements from farmers.

All things considered, the market for farm computers and related software was expected to increase substantially over the next five years (Exhibit 1).

Agriculture Finance

While the general farm public was not yet fully convinced of the merits of computerization, the ag-business sector seemed ready to buy. Over 60 percent of farm lenders had at least one microcomputer in 1984, and half of those remaining were planning a computer purchase in the near future. The nature of credit analysis for farm loans requests had changed dramatically over the past two years. Prior to that time most banks approved farm loans on the basis of collateral; simply making sure there was sufficient property to cover the loan. However, a rapid decline in farm land values during the past two years, had caused farm lenders to rethink their loan analysis procedures. Land prices had been driven down because farm prices had been weak and farm profitability was poor. Many farm operators had declared bankruptcy. There was no prospect of a near term reversal of this poor farm income situation. Banks and credit unions were finding it necessary to carefully analyze the farmers' operations and generate projected financial statements. Because this cashflow analysis was often very complex, bankers were actively seeking the assistance of microcomputer systems. Nevertheless, in 1985 it was estimated that less than one percent of these institutions used software specifically designed for agriculture finance applications. An analysis of farm credit, farm supply and farm consulting business in the U.S. suggested a market size of about 85,000, broken down as follows:

	Total Number
Farm Lenders -banks, credit unions	12,000
Farm Suppliers -farm stores, machinery & fertilizer dealers	64,000
Farm Consultants -accountants, farm management firms, farm real estate firms, gov't extension offices	9,000
	85,000*

*Note: A comparable estimate for Canada was 8,000 - 10,000 ag-business outlets.

The smallest but fastest growing sector was expected to be farm consultants, as farmers increasingly relied on outside expertise to help with their financial and tax planning. Exhibit 2 shows one estimate of future growth in the market for ag-finance software.

Homestead's History

The forerunner of Homestead Computer Services was a Winnipeg based agricultural consulting firm known as Westburn Development Consultants Ltd. In 1977, Westburn was purchased by its General Manager, Mr. Sheldon Fulton, an M.B.A. graduate from the University of Manitoba. At a dinner meeting in 1979, Fulton heard California computer guru Adam Osborne speak about the wonders of the microcomputer, and thought the machines might have many uses in agribusiness and farming. As a result, Homestead Computer Services Ltd. was formed in June 1979, and Fulton set out to develop a microcomputer software package called the "Farm Management System" which was designed to assist farmers in running their operations more efficiently.

In 1980 the fledgling company landed a contract to develop and install a computer assisted trading system for the Winnipeg Commodity Exchange, resulting in one of the largest and most diverse applications of microcomputers in Canada at the time. The following year, Homestead and Westburn were amalgamated, with Westburn as an operating division engaged in agriculture consulting.

Due in part to the success of the new system at the Winnipeg Commodity Exchange, Homestead, in 1982 was awarded a contract to install an automated trading system for the London International Financial Futures Exchange (LIFFE) in London, England. A subsidiary company, Westbourne Computer Ltd., was established in London to provide ongoing maintenance for, and develop new projects related to, the LIFFE project.

Also during 1982, Homestead opened an office in Calgary and started initial development work on an electronic marketing system for agricultural commodities. Later that year, the Saskatchewan Beef Stabilization Board retained Homestead to install a microcomputer system to support the Board's marketing and accounting departments, and the Illinois Farm Bureau signed an agreement to market the Farm Management System under private label to its members.

In May 1983, Homestead was approved as a "Value Added Dealer" for IBM computer equipment. This enabled the company to purchase IBM microcomputers at wholesale prices, then sell the hardware with a farm software package as a complete "turnkey" system. That same year, development work was started on hog and dairy management software as an addition to the Farm Management System product line. In an effort to reach more of the U.S. market, Homestead, late in 1983, formed a subsidiary called Homestead Management Systems Inc. in Des Moines, Iowa.

In 1984, Homestead was hired to set up a "Computer Assisted Commodity Trading Information System" (CACTIS), which linked eleven Ontario meat packing plants belonging to the Ontario Live Auction Markets Association.

In an effort to centralize development and marketing activity for proprietary software products in Winnipeg, the Calgary office was closed in August and two of the employees were moved to Winnipeg. Also, the American operation (Homestead Management Systems) did not achieve target sales levels and the President was "relieved of his duties" early in 1985, leaving one person behind to develop a business plan and marketing strategy.

Through 1984 and into 1985, Homestead had developed a software package called the "Farm Financial Planner" which was aimed at the farm credit market. In June 1985 the company and its U.S. subsidiary, Homestead Management systems, won a large contract to develop a loan analysis program for the Federal Land Bank of Louisville, Kentucky. The resulting software was issued to branches of the bank to analyze farm loans in Kentucky, Ohio, Indiana, and Tennessee. In late 1985, Homestead in cooperation with the Royal Bank of Canada, planned to introduce a farm financial planning package called "Farm Financial Assistant." This was to be distributed in agricultural areas across Canada by Homestead.

Over a period of six years, Homestead had grown from a one-man operation with total yearly sales of just over $100,000, to a well established operation with a full time staff of 22 and gross annual revenues in excess of $2.7 million.

Company Operations

Homestead was organized into two main operating divisions: Consulting and Contract Services (Westburn Consultants), and Software Production and Marketing. Consulting projects ranged from general overviews to specific economic feasibility studies, primarily in the grain industry and related areas such as transportation and information systems; contract services related to the development and implementation of customer-specific "turnkey" computer systems. In recent years consulting and contract services had been approximately four times the size of Software Production and Marketing in terms of resources employed and revenue generated. Not a great deal of marketing effort had been devoted to developing the consulting and contract service side of the firm. It was seen as desirable to increase the proportion of software revenue. As illustrated in Exhibit 3, the two divisions were closely related and in fact worked together rather than as autonomous units. The operations policy of Homestead was that software systems would be developed by the consulting and contract services group and would be converted into proprietary products to be further developed and widely marketed by the software production and marketing division.

By combining expertise in the fields of businesses, agriculture and computer science (Exhibit 4), Homestead had been able to attain a strong competitive position in the marketplace. Following a shake up in the industry, the company had emerged as one of the leading Canadian suppliers of farm management software, and the number one supplier of farm credit analysis software. Despite their relatively small size Homestead was considered one of the top five ag-software producers in North America, and had completed a number of successful consulting projects in Canada and the United States (Exhibit 5).

Marketing

As of November 1985, the company had two major software products in the market, namely: The Homestead Farm Management System, and The Homestead Farm Financial Planner. It was anticipated that a Farm Financial Assistant would be added within months. (Exhibit 10).

Developed in 1979 and introduced in March 1980, the Farm Management System was an integrated stand-alone microcomputer system specifically designed for larger farm operations desiring accounting, record-keeping and management assistance, (Exhibit 8). The software system was composed of 15 modules which operated together but could be purchased separately depending upon the farmer's needs. Homestead maintained a policy of changing premium prices for its software in exchange for superior products and service. Following are some representative product descriptions and prices:

Homestead Farm Management System

Software Description		Retail Price
Basic Package		$1,645
Including: Accounting Module	$845	
Inventory	$545	
Fixed Asset Record Keeping	$345	
Cash Flow	$ 95	
Crop Planning Module		$ 250
Beef Herd Record Keeping Module		$ 500
Hog Planning Module		$ 250
Dairy Herd Management System		$2,500

The Homestead Farm Financial Planner, targeted at financial institutions, (Exhibit 9) was introduced in early 1985 as a highly sophisticated, flexible tool for projecting a farm's financial situation. It was designed for use by ag-financial professionals both for farm management consulting and for analysis of farm loans. The approximate retail price of this software package was $2,500.

A related but simplified product, targeted for use by farmers was developed in conjunction with the Royal Bank. This Farm Financial Assistant (Exhibit 10), retailed for $395 and was designed to provide completed financial reports, under a variety of "what if" situations, which could be easily understood by both the farmer and banker.

Despite all the advantages, farmers had been very slow to accept computer technology, and only 250 individual farmers had bought farm management software by mid 1985. Surveys indicated that approximately six per cent of Canadian farmers had purchased a computer by 1985, but this was well below the company's earlier estimates of 20 percent. Sheldon Fulton explained his reasoning for this:

> "Our Farm Financial Planner and Louisville systems are meeting real needs or recognized real needs of banks and other financial institutions. On the other hand, the Farm

Management System, which caters to individual farmers, is more-or-less meeting latent needs.

There is no question that you can demonstrate benefit, and that the farmer has a need to improve his farm management, record keeping, accounting and planning routines, and that you can develop products that would do all of those things. However, the farmer does not perceive the need, it's still latent.

The great majority of farmers still say they don't need a computer, but we are not selling computers, we are selling good farm management.

It is very difficult to demonstrate to farmers that they have a real need, when they are spread out geographically all over North America, and most of our selling is done one-on-one."

As a "value added dealer" for IBM, Homestead was able to offer microcomputer hardware at competitive prices to its farm software customers. If a client did not own any hardware, Homestead was in a position to offer a complete "turnkey" package consisting of hardware, software and after sale support. Exhibit 6 shows that the company's hardware sales had been increasing steadily over the past three years.

Farm Management System software was marketed in Canada through ten authorized Homestead dealers in ten locations across the prairies and in Ontario. Working on a commission basis, these dealers were directly responsible for selling Homestead's various Farm Management system products. Prospects which were received by the head office through trade shows or advertising, were passed on to the dealers for followup. The company also had four dealer representatives who acted as liaison between head office and the dealers. These reps assisted the dealers with system installations, customer training and trade shows. Dealers received an allowance (which was built into the price of the software), if they provided customer training, otherwise dealer reps would do the training and Homestead would keep the allowance.

In the United States, the Farm Management System was sold through Homestead Management systems Inc. directly to the major distributors (e.g. Illinois Farm Bureau), on a wholesale basis. Homestead offered these distributors the right to duplicate and sell their software under private label, in return for a unit royalty fee. Unlike the situation in Canada, Homestead in the U.S. had no direct contact with the end-users of their farm management software.

Homestead's financial and credit analysis software (Farm Financial Planner), on the other hand, was sold in Canada directly to customers without the use of dealers or distributors. In the U.S. almost all sales of the Farm financial Planner were also direct to customer, but Homestead had recently established four dealers to promote their financial and credit analysis products.

In general, dealers or distributors received a margin of 40-60 percent of retail for the Farm Management System, and 40-50 percent of retail for selling the Farm Financial Planner software.

For the first time, the company was going to try a direct mail campaign to 20,000 farmers selected from the "Country Guide" mailing list. Homestead's customers were generally younger and better educated than average and had gross yearly incomes of over $100,000. The mailing list allowed them to target these farmers in selected geographic areas. According to Mr. Fulton:

> "We are trying this mail campaign to see if there is a price sensitivity for hardware and software and to generate leads. I believe there are many farmers on the verge of buying a computer and we want to push them over the brink by clearing up their questions and offering a very good price.
>
> If we sell a hundred machines we more than break even, but even if we don't sell that many we should learn a lot about our marketplace."

Finance

Homestead's policy of expensing all R & D costs each year resulted in substantial losses being reported on the financial statements (Exhibit 7). As a high technology research-oriented company, Homestead had to keep on top of new hardware and software developments in order to keep pace with the competition. Development of new products and markets was expensive but necessary. In Fulton's words:

> "The most difficult part of our business is finding capital, and there is always the choice to make between investing in market development or investing in product development.
>
> If we spend too much money on product development, we don't have anything left to market it with, but if we were to spend all our resources on market development, we don't have any capital to build new products.
>
> The decision to an extent is governed by how we raise our capital. If we raise capital through Scientific Research Tax Credits, we have to expend a certain amount of money on product development."

To date, Homestead had allocated about 75 percent of their available resources to product development, and 25 percent to market development.

Due to the nature of the products and risks involved, it was difficult or impossible to finance startup or growth by conventional means (i.e. bank loans secured by the assets or future earnings of the company). As a result, Fulton felt high-tech companies such as Homestead typically went through a three stage financing process.

The first stage was usually the easiest and involved raising seed capital to get the business up and running. If the company had a sound business plan, venture capital and some government assistance could usually be found to supplement shareholder's contributions. Once running, the newly established company would require more financing to gear up production and marketing functions. This second stage was more difficult and usually involved fairly large dollar amounts. A research oriented company might have trouble with internal financing at this time because, presumably, earnings resulting from R & D would not be realized until sometime in the future. Nevertheless, by making a forceful presentation and perhaps using "sweeteners" such as stock options or SRTC's,[3] additional venture capital could be found. If the company's products were successful in the market, it was likely that no additional outside financing would be required after the second stage.

Homestead had progressed through the first two stages of financing and now found it necessary to raise more capital to further develop the largely untapped market for agricultural software. This third stage of financing was the most difficult for the company. The original shareholders, desiring a return on their investment, were not anxious for further dilution of their ownership through more venture capital share issues. One option which Homestead was considering was going public.

From Homestead's point of view, there were pros and cons to being publicly listed on a stock exchange. A listing would offer existing shareholders better liquidity, and if successful, would provide the company with the required cash inflow for future expansion. However, stock exchange listings were difficult and expensive to arrange, required public disclosure of financial statements, and would result in share dilution and possible loss of control. The dilution factor might not concern the existing shareholders if new shares could be issued at a price high enough to increase the overall value of their holdings, even though their relative percentage of ownership might decrease. On the subject of ownership, Mr. Fulton had the following comments:

> "I've never had much trouble with the idea of selling shares in the company; I used to own 100 percent, now I own less than thirty.
>
> I believe in intellectual control as opposed to equity control. As long as it's in the best interests of the company

---

[3] Scientific Research Tax Credits - A form of tax credit to investors in Canadian research oriented companies. SRTC's were cancelled by the Federal government in late 1984.

> to have me involved, I'll be President. At the point in time when it is not best for the company, there is a mechanism to have me removed. If I'm removed it will presumably be for the good of the company, in which case it is still in the best interests of myself as a shareholder.
>
> Regardless of ownership, you have to be able to convince people that an investment in this company is going to result in a net increase in their share value."

Control

Homestead controlled costs on internal research and development projects in the same way they monitored contracts with outside clients. Each R & D project was set up as a separate 'contract', complete with its own budget in a separate account. All staff working on the project billed their time against the allocated budget, and regular progress reports were submitted to management.

If a project looked like it was running behind schedule or over budget, management had to decide whether to scrub it or allocate more resources.

Although Mr. Fulton consulted closely with his managers in reviewing new or ongoing projects, he made the final decision as to where Homestead's resources would be allocated.

Management and Personnel

Homestead's operations were planned and supervised by a management committee consisting of Sheldon Fulton, President; Penny Kelly; V-P Contract and Consulting Services (Westburn); Dwight More, Director of Marketing; and David Miles, Homestead Management Systems (U.S.A.). This committee, (with the exception of David Miles who would telephone from Des Moines), would meet every Monday morning to discuss corporate goals, problems and new ideas. Although he was President and Chairman of the Management Committee, Fulton had high regard for the opinions of other committee members, and occasionally had his own ideas vetoed at the meetings. During a typical week, Mr. Fulton would spend about one-third of his time interacting with programmers and other staff, another third developing new markets for the company's products, and another third on consulting activities and administrative tasks, including all financial matters.

He realized that Homestead's relatively small size offered limited career potential for some of his most important employees:

> "Developing software is a creative exercise which requires creative, bright, motivated people. We now have five senior software developers who have been with the company for a few

> years and are starting to feel a little burned out. Almost all of their time is spent programming when they would prefer to be doing more creative design work."

November 1985

Homestead's success, according to Mr. Fulton, had been largely attributable to his staff, with their unique blend of agriculture and computer expertise. The company was able to keep pace with rapidly changing hardware and software technology, by continually developing new products and updating existing software. In his words:

> "We have a couple of projects underway now that are in two new technological areas we see as having tremendous growth potential in the future. One is in computer based training using interactive video, and the other is in the artificial intelligence/expert systems area.[4] We are working on integrating those technologies into our future products."

Although large R & D expenditures during the past few years had, in management's opinion, resulted in the production of some excellent products, market acceptance had been slower than forecast. Given the general reluctance of farmers to accept computer technology, the management team felt it might be appropriate (at least in the short term), to channel more resources into marketing financial planning software, rather than the farm management software. "The problem", said Fulton, "is not the size of the market or the competition, it is getting to the market and turning those latent needs into real needs."

Fulton's dream was for Homestead to "become North America's premier supplier of the innovative use of computer technology in agriculture." In order to achieve that objective, he realized that the company would have to become significantly larger in terms of its marketing and research activities.

Should the company go public and sell shares, or perhaps team up with a major partner from agri-business? What products or services should they focus on in the future? Should they "rent out" some of their software expertise to other companies? These were some of the questions which Mr. Fulton wanted to raise at the upcoming Management Committee Meeting.

---

[4] Artificial intelligence/expert systems are software programs which can simulate human thought by making decisions based on a store of knowledge and list of rules. For example, a computer might be programmed to recommend specific soil fertilizer applications based on a series of observations by a farmer.

On the following Monday morning, the small group of managers met in Mr. Fulton's office. He led off the discussion:

> "Good morning everyone and I'm glad to see you have all made it here in spite of another snowstorm last night. As you know, we have to make some decisions on expanding our operations so that we can meet our sales objectives. As shareholders, I'm sure you're just as anxious as I am to see this company grow.
>
> Lately, our biggest problem has been a lack of capital to develop our markets and to continue research in new technologies. I believe we should seriously consider going public, but first we have to convince a securities exchange of our worthiness, and then we have to convince the public that shares in Homestead are a good investment."

Fulton looked at each of his managers; "do you have any suggestions?"

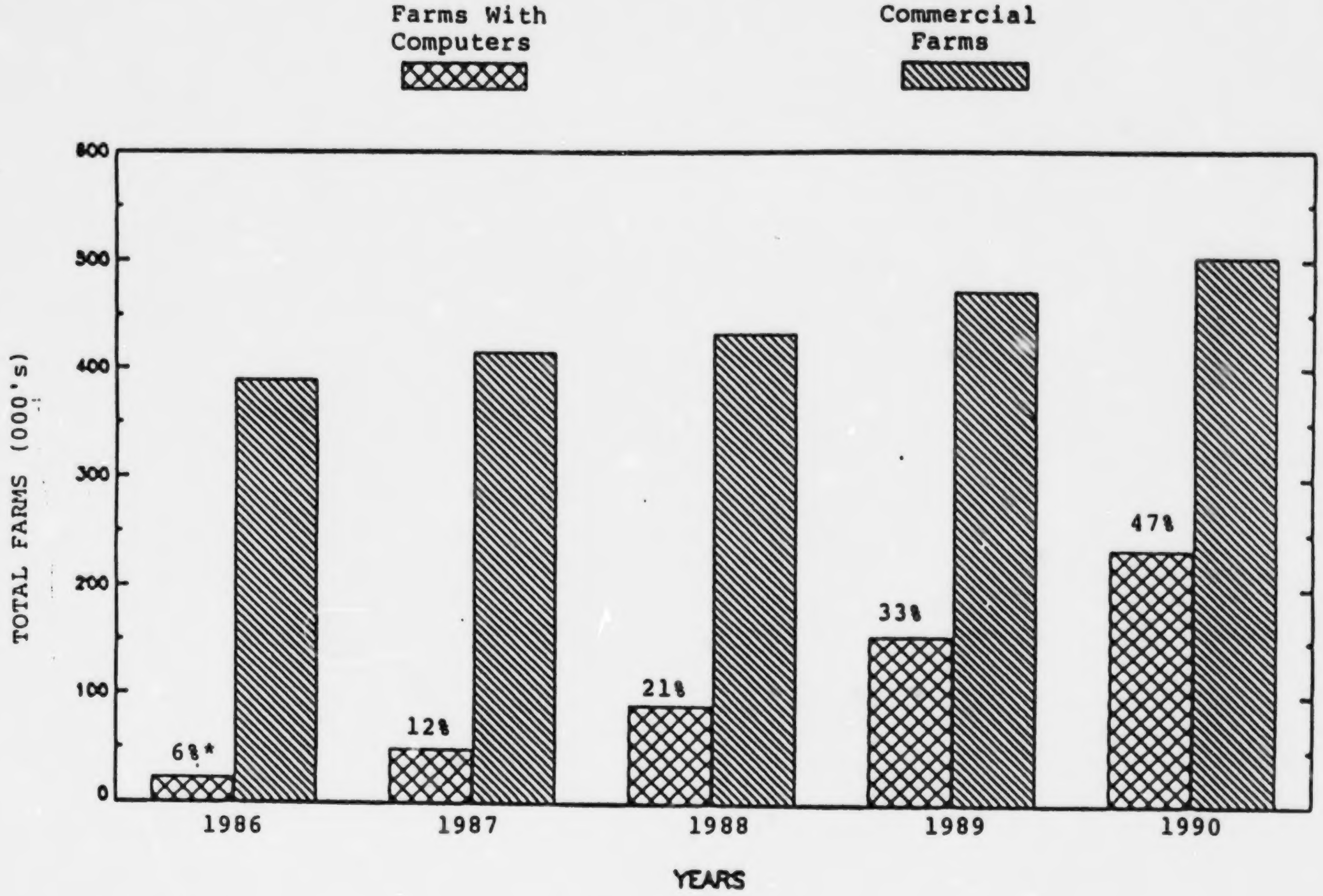
EXHIBITS:

HOMESTEAD COMPUTER SERVICES LTD

Exhibit 1

ESTIMATED MARKET FOR FARM COMPUTERS

(United States)



* Percentages indicate the proportion of commercial farms using computers.

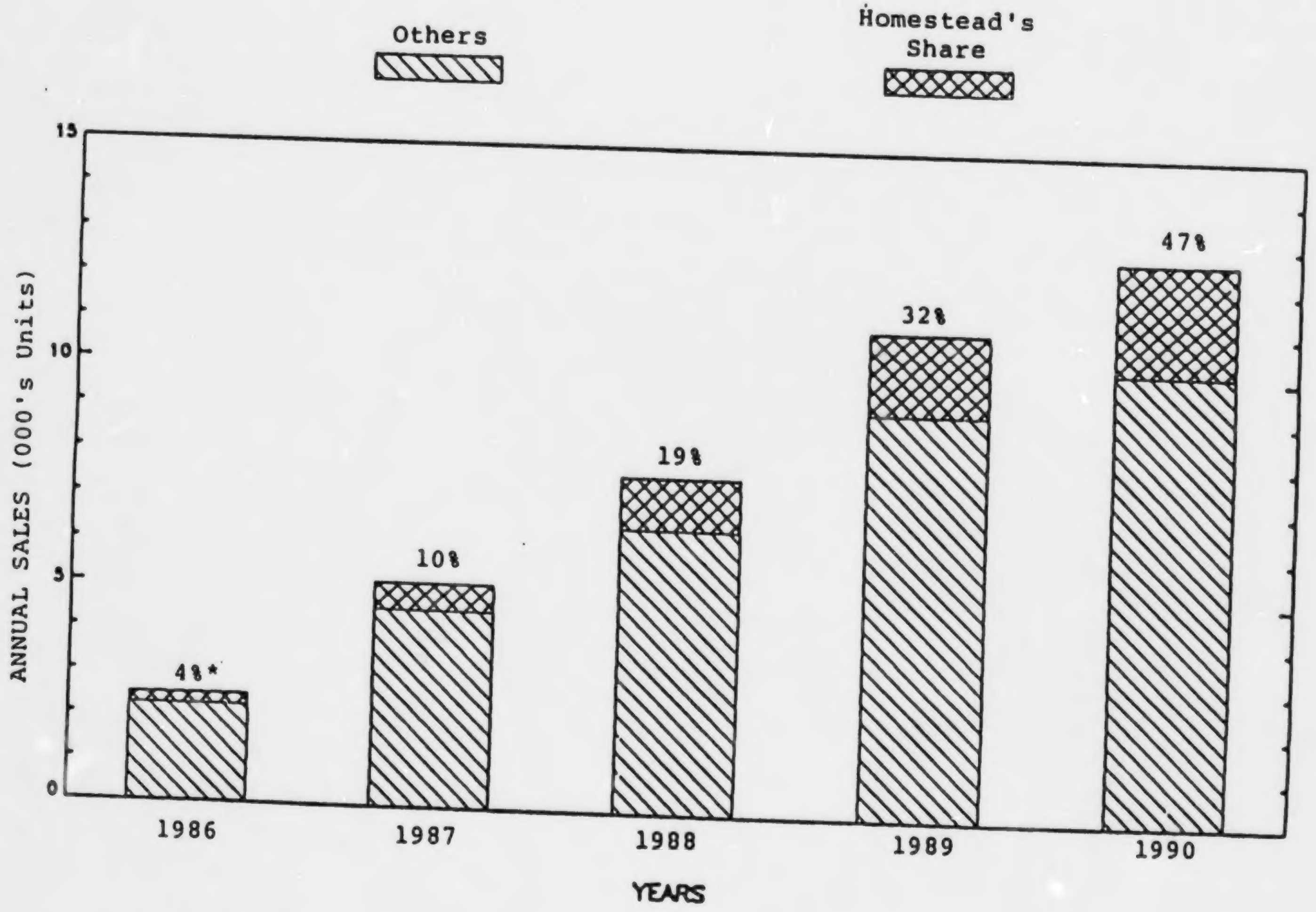
Note: Commercial Farms are large farms with gross annual income over $100,000.

Source: Company prospectus.

Exhibit 2

ESTIMATED SALES OF AG-FINANCE SOFTWARE

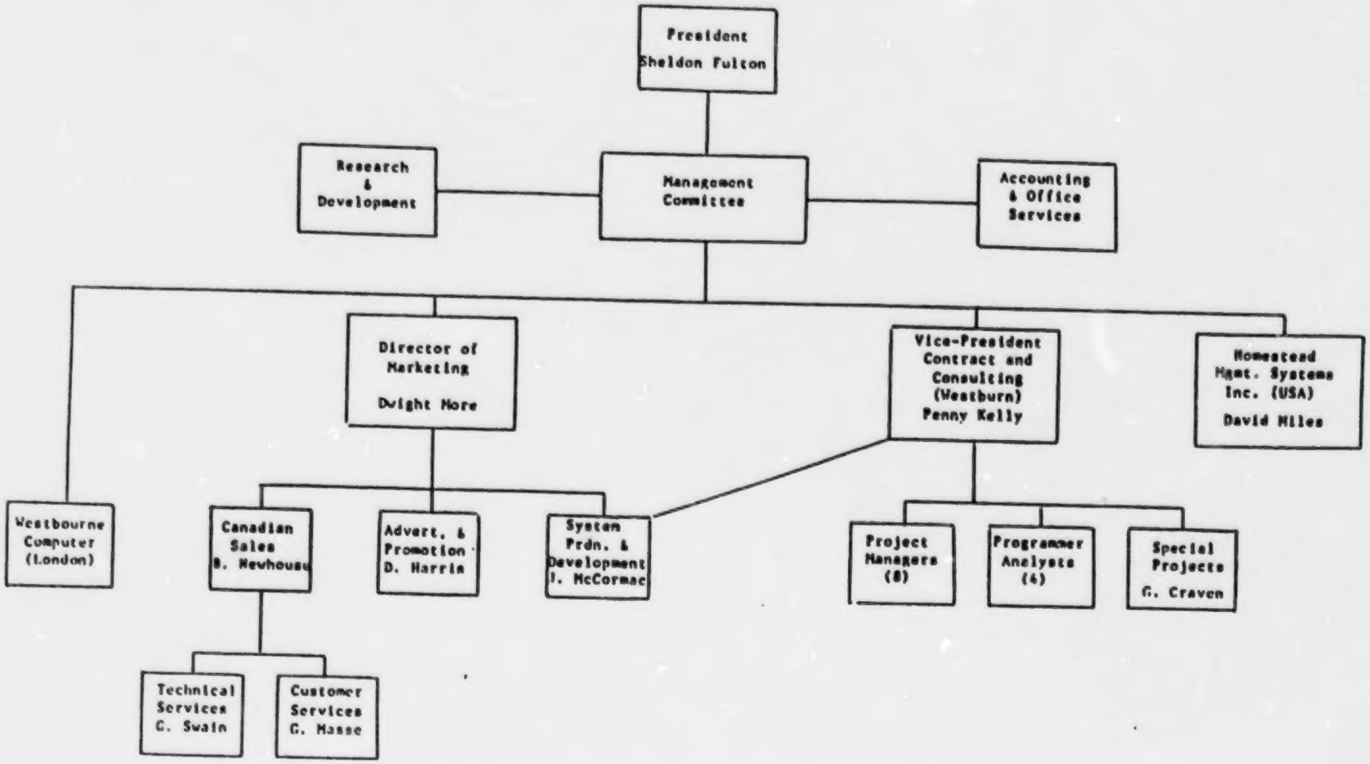
(United States)



* Percentages indicate the proportion of lending institutions using Ag-Finance software programs.

Source: Company prospectus.

Exhibit 3
HOMESTEAD COMPUTER SERVICES LTD.
ORGANIZATION CHART


President
Sheldon Fulton
Research & Development
Management Committee
Accounting & Office Services
Director of Marketing
Dwight More
Vice-President Contract and Consulting (Westburn)
Penny Kelly
Homestead Mgmt. Systems Inc. (USA)
David Miles
Westbourne Computer (London)
Canadian Sales
B. Newhouse
Advert. & Promotion
D. Harris
System Prdn. & Development
J. McCormac
Project Managers (8)
Programmer Analysts (4)
Special Projects
G. Craven
Technical Services
C. Swain
Customer Services
G. Masse

Source: Company Records (1985)

Exhibit 4

HOMESTEAD COMPUTER SERVICES LTD.

EMPLOYEE PROFILE

Name	Age	Education	Time with Homestead
S. Fulton	37	B.Sc.(Math), M.B.A.	> 6 years
D. More	32	B.Sc.(Ag.)	< 1 year
P. Kelly	32	B.Sc.(Ag.), M.B.A.	4 years
D. Miles	28	LL.B., M.B.A. (Harvard)	2 years
B. Newhouse	30	B.Sc.	4 years
D. Harris	32	B.Sc.(Ag.)	2 years
J. McCormac	29	B.Sc.(Comp. Sc.)	6 years
G. Craven	32	B.Sc.(Comp. Sc.), M.Sc.(Ag. Econ)	3 years
Project Mgrs.	28(avg.)	B.Sc.(Comp.Sc.)	4 years (Avg.)
Programmers	26(Avg.)	Comp.Sc.(2 yr. Tech. Course)	2 years (Avg.)

Source: Company Records 1985.

Exhibit 5

Homestead Computer Services

Products and Services

A. Consulting & Contract Divison*

Feasibility Studies
- B.C. Ministry of Economic Development
- Maple Leaf Mills Ltd.
- Canadian Egg Marketing Agency
- Canadian International Development Agency

Modelling and Simulations
- Port of Montreal Authority
- Manitoba Egg Producers' Marketing Board
- Dominion Marine Association

Handling and Transportation Analysis
- Grains Group/Transport Canada
- Pioneer Grain Co.
- Port of St. John
- Quebec & Ontario Transportation Co.

System Studies and Implementation
- Winnipeg Commodity Exchange
- London International Financial Futures Exchange
- Saskatchewan Beef Stabilization Board

B. Software Production & Marketing Division

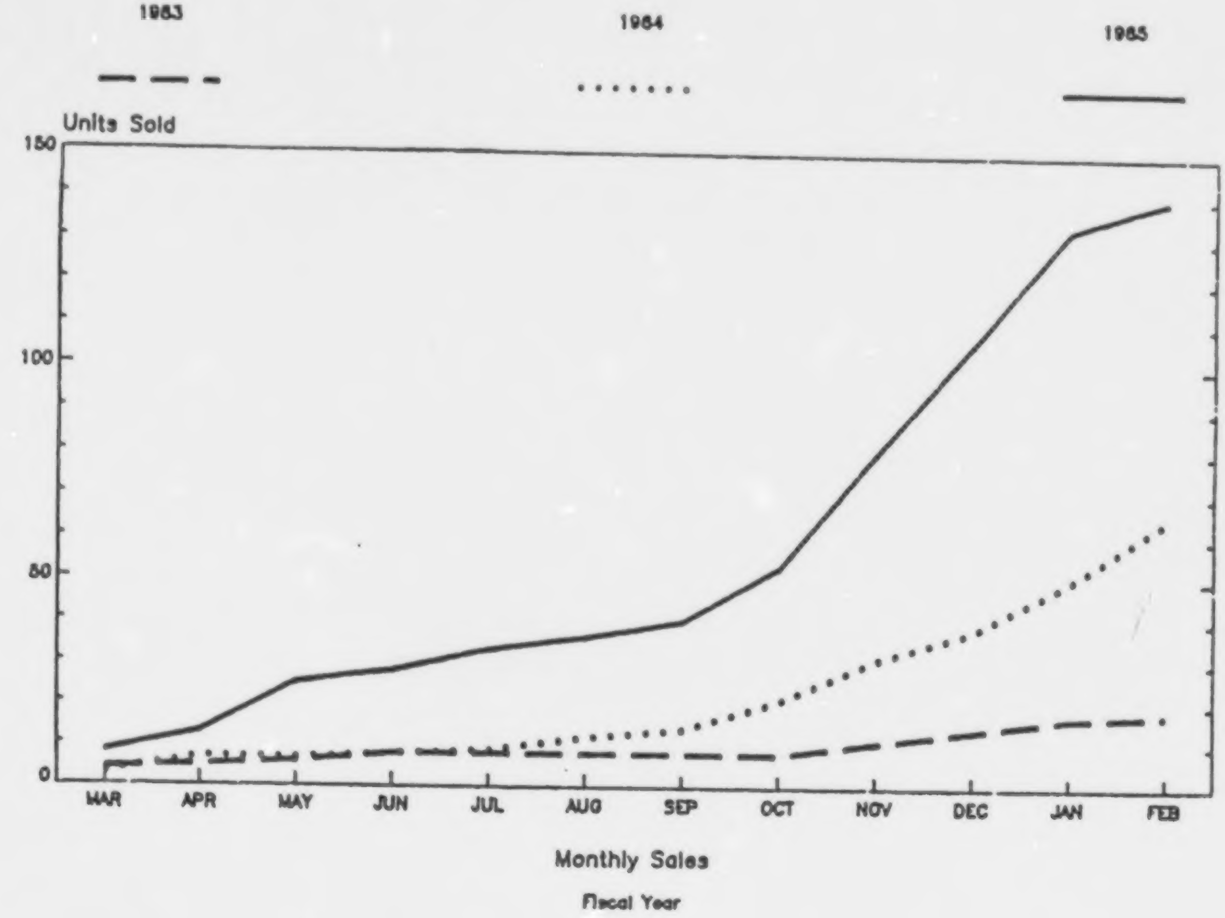
Software Development
- Homestead Farm Management System
- Farm Financial Planner
- RoyFarm Financial Assistant

*System Studies & Implementation accounted for over 80 percent of consulting and contract division revenues.

Exhibit 6

HOMESTEAD HARDWARE SYSTEMS SALES

CANADA 1983 - 1985



Source: Homestead 1985 Annual Report.

Exhibit 7

HOMESTEAD COMPUTER SERVICES LTD.

FINANCIAL STATEMENTS

Homestead Computer Services Ltd.

Consolidated Balance Sheet

	as at 1985	Feb. 28 1984	($000's) 1983	Use	Source
Current Assets					
Bank Term Deposits	80	-	-	80	
Accounts Receivable	436	274	318	118	
Inventory of Computer Equip.	338	221	131	207	
Prepaid Expenses	19	3	2	17	
Work in Progress	15	7	-	15	
Recoverable Expenses (note 1)	-	160	14		14
	888	665	465		
Fixed Assets					
Computer Equipment	377	178	49	328	
Furniture & Fixtures	49	46	22	27	
Leasehold Improvements	8	8	2	6	
Automobile	18	18	18	0	
Accumulated Depreciation	(111)	(79)	(33)		78
	341	171	58		
Other Assets					
Investment in Affiliated Co. (note 2)	-	-	55		55
Shareholder Loan (note 3)	50	-	-	50	
Goodwill (note 4)	361	371	335	26	
Incorporation Costs	13	14	12	1	
	424	385	402		
Total Assets	$1653	1221	925		

Homestead Computer Services Ltd.

Consolidated Balance Sheet

	As at 1985	Feb. 28 1984	($000's) 1983	Use	Source
Current Liabilities					
Bank Indebtedness (note 5)	363	318	41		322
Accounts Payable	586	427	157		429
Debenture Payable	40	-	-		40
Current Portion of Term Loan	30	-	-		30
Income Taxes Payable	6	35	-		6
	1025	780	198		
Long-Term Liabilities					
Term Bank Loan (note 6)	120	-	-		120
Deferred Incomes Taxes	9	11	15	6	
	129	11	15		
Shareholder's Equity					
Capital Stock (note 7)	797	692	483		314
Deficit	(588)	(560)	(77)	511	
Valuation Surplus (note 8)	290	298	306	16	
	499	430	712		
Total Liabilities & Equity	$1625	1221	925		

Homestead Computer Services Ltd.

Consolidated Statements of Operations and Deficit

	Year Ended 1985	Feb. 28 1984	($000's) 1983
Income			
Development & Consulting Revenue and equipment sales	1,716	1,433	1,450
Other Income (note 9)	995	527	-
	2,711	1,960	1,450
Expenses			
Operating Expenses	1,625	1,653	1,263
R & D expenses (note 10)	1,064	673	189
	2,689	2,326	1,452
Gross Income (loss)	22	(336)	(2)
Other Expenses			
Amortization of Goodwill	10	10	9
Other	-	-	20
Depreciation of Fixed Assets	38	47	18
Interest	43	37	19
	91	94	66
Loss Before Income Taxes	(69)	(460)	(68)
Provision for (recovery of) Income Taxes	(33)	31	(8)
Loss for the Year	(36)	(491)	(60)
Share in Loss of Affiliated Co.	-	-	(46)
Total Loss for the Year	$(36)	(491)	(106)
Retained Earnings (Deficit)			
Beginning of Year	(560)	(77)	21
Loss for the Year	(36)	(491)	(106)
Transfer from Valuation Surplus	8	8	8
End of Year	$(588)	(560)	(77)

Homestead Computer Services Ltd.

Consolidated Statement of Changes in Financial Position

	Year Ended Feb.28 [$000's]		
	1985	1984	1983
Source of Funds			
Operations			
Loss for the year plus depreciation and other items not requiring an outlay of funds	8	-	-
Issuance of Shares	105	209	310
Proceeds on Bank loan	150	-	-
Proceeds on disposal of fixed assets	41	2	-
	$305	211	310
Applications of Funds			
Operations			
Loss for the year less depreciation and other items not requiring an outlay of funds	-	431	13
Purchase of fixed assets	245	161	58
Current payments on term loan	30	-	-
Shareholder loan	50	-	-
Incorporation costs	3	2	7
Investment in affiliated co.	-	-	101
	328	594	179
Increase (decrease) in working capital for the year	(23)	(383)	131
Working capital (deficiency) beginning of year	(115)	268	137
Working capital (deficiency) end of year	(138)	(115)	268

Notes to Financial Statements

1. 1984: $160,000 R & D expenditures recovered from the issue of Scientific Research Tax Credit (SRTC) debentures issued subsequent to year end. In 1983 $14,000 income taxes were recoverable.

2. This amount represents 50 percent ownership of Homestead Computer Co. of Evanston, Illinois. A small company set up to coordinate marketing of the Farm Management System in the U.S.

3. The shareholder loan bears interest at prime minus 2% and is due Dec. 31, 1986. Security is by way of an assignment of 10,000 common share of the company.

4. Goodwill represents excess of valuation of assets over original cost, goodwill of predecessor companies, and goodwill arising from investment in Homestead Management Systems Inc.

5. The company has an operating line of credit of $300,000, insured by accounts receivable and a personal guarantee of $300,000 from one of the shareholders.

6. The loan is repayable in the amount of $30,000 each year from 1985 to 1989. Interest at prime plus 2% payable monthly. Security for the loan as in note 5.

7. Common share ownership is as follows:

Sheldon Fulton	28%
Homestead Employees	17%
30 outside shareholders (including directors) -no individual holds more than 4 percent	55
	100%

8. Valuation surplus is the excess value of assets over original cost, less accumulated amortization.

9. Other Income includes proceeds of SRTC share and debenture issues in years 1984-85, as well as a $100,000 federal government grant in 1985.

The company's policy to record as other income, the entire proceeds of share and debenture issues when such proceeds are designated for research and development under the Income Tax Act, is not in accordance with generally accepted accounting principles.

Had only the transferred tax benefits been recorded as income, the loss for the year ended an deficit at February 28, 1984 would have been increased by $161,000 and the issued share capital would have been increased by the same amount. Similarly for the year ended February 28, 1985, conventional accounting procedures would have resulted in a decrease in other income of $460,000.

10. All research and development costs are expensed as incurred. From its inception until February 28, 1985 the company has expensed total R & D costs of $2,016,000.

Exhibit 8

HOMESTEAD COMPUTER SERVICES LTD.

HOMESTEAD FARM FINANCIAL PLANNER LITERATURE

Comprehensive Farm Financial Planning... Step By Step.

The Homestead Farm Financial Planner is designed for easy use and fast, comprehensive results. It operates on the IBM PC and XT, the Hyperion and most IBM-compatible computers. Using the easily understood, menu-driven format, you can key in raw data supplied by an applicant or client during an interview or from standardized input sheets. With a portable PC, you can even conduct the input session at a farmer's kitchen table.

Built-in enterprise data tables provide standardized ratios, formulas and values which give you an in-depth analysis of a farmer's opening position, cash flow and plans of operation. In addition, these data tables can help compensate for a lack of sufficient or precise information from your client or applicant.

Printed output is in the form of standardized, easily read pro forma balance sheets and financial statements which give you a logical basis for making sound recommendations and credit decisions.

Information Collection

The accuracy and amount of information captured at the beginning of the planning process obviously determines the quality of the results that can be generated. The Homestead Planner allows you to input a comprehensive range of data supplied by your client or applicant. This includes:

Physical and Financial Information

- Total acreage; tillable and permanent pasture acres; livestock facilities
- Enterprises in operation
- Current, interim and long-term assets and liabilities

Enterprise Plans of Operation

- Direct or variable costs
- Types of crops or livestock
- Opening inventories
- Planting intentions
- Purchases
- Expected production
- Expenses
- Expected sales
- Timing estimates

Non-Farm, Non-Enterprise Information

- Non-farm income
- Living expense
- Overhead or indirect costs
- Capital adjustments
- Depreciation

The Homestead Planner Data Tables

A unique advantage of the Homestead Farm Financial Planner is the built-in data table available for each of 15 different crop enterprises and six livestock enterprises. The data tables provide documented, industry-accepted values and ratios such as least-cost feed formulations for livestock. These are used in making in-depth analyses of various scenarios for the farmer's plan of operations.

In addition, the data tables can be used to supplement and check against data provided by your client or applicant. For example, the Hog (Farrow-to-Weaning) Enterprise data table provides standard values for

- feed costs
- veterinary, medicine and supplies
- maintenance and repairs
- buying/selling prices
- utilities
- insurance
- death loss
- labor

Analysis and Evaluation

Utilizing input provided by the farmer and from the data tables (plus values and parameters established by your own organization), you can perform a variety of sophisticated analyses that will depict cash flow, inventory flow and the outcome of various operating scenarios.

The final product of the Homestead Planner is the printout of a series of pro forma financial statements and comparative ratios. These give you and your client or applicant the opportunity to evaluate his capacity to service loans of various amounts. Lending officers can also use the comparative ratios to decide how one loan request compares with another. Simulations can be run at subsequent intervals to monitor progress so that corrective action, if necessary, can be taken quickly. And, at the end of the period, you can enter actual figures to generate a report which displays both budgeted and actual amounts in columns adjacent to one another.

The Homestead Farm Financial Planner — a flexible, fast and reasonably priced software package that is custom-designed for agrifinance professionals and organizations seeking better ways to meet the challenges of farm economics today.

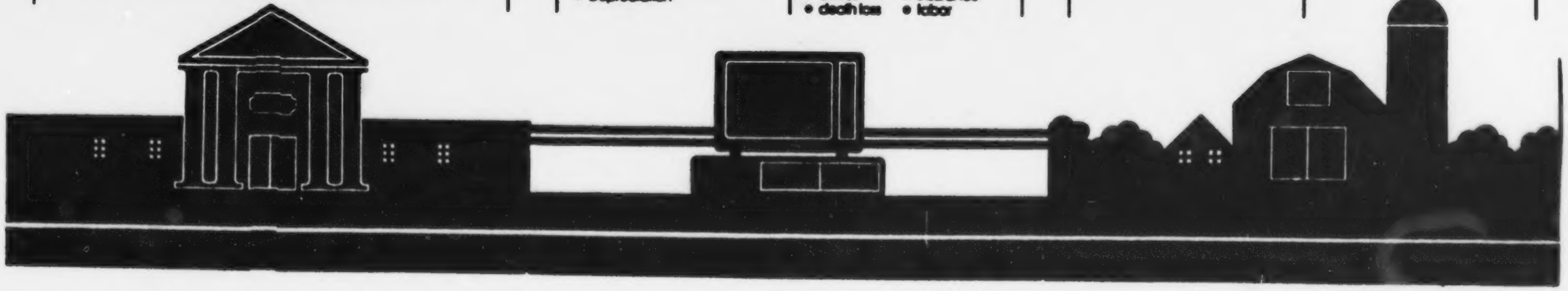


Exhibit 9

HOMESTEAD COMPUTER SERVICES LTD.

HOMESTEAD FARM MANAGEMENT SYSTEM LITERATURE

The Homestead Farm Management System

There's as much paperwork as there is fieldwork in farming today. The successful farmer recognizes that sound business management is as important as efficient production methods. Good business managers depend not only on recording information but also on the ability to analyse it.

It's the analysis of your records that indicates your actual position, your profit and loss centers, and your effective production techniques. And it's the timeliness of the analysis that lets you take advantage of market opportunities that could mean the difference between a profitable enterprise or a loss.

That's where the Homestead Farm Management System comes in. Homestead recognizes your need for detailed activity reports for daily decision making, and broader financial overviews to satisfy external agencies. With our Accounting software you can generate profit and loss statements and balance sheets for your complete operation or individual enterprises for any time period you require. Printed reports are in a format familiar to your accountant and banker.

With our series of Enterprise software you can analyse your operation in greater detail than is possible within standard accounting framework. Reports specific to each enterprise help you to identify your profit areas and to make adjustments where improvement is necessary.

Homestead's computer software is specially designed to suit the agricultural sector. Unlike most of the other agricultural software available, which has been adapted from urban small business applications, the Homestead System has been developed by farmers for farmers to accommodate the specific requirements of a farm business.

The Homestead Farm Management System offers you

Flexibility:

You define categories (accounts) to suit your operation. The Accounting program allows for nine different profit centers with 30 different major accounts and 30 subaccounts for revenues and expenses. The Enterprise programs also provide similar levels of account and subaccount flexibility. There's plenty of capacity to track every item in your farm operation.

Ease of Use:

You can't get "stuck" in a program. The software has been programmed to prompt you with reminders or questions to guide you logically through program routines. Whenever choices must be made you are presented with a menu of options from which to choose.

Error Avoidance:

A number of special programming techniques prevent either data loss or incorrect entry. Enter an incorrect response and the computer waits until you give the correct command. Homestead has also included safeguards so that neither the software or main data storage can be harmed by an operator's incorrect command.

Progressiveness:

Homestead is constantly in touch with changes on the agricultural scene and updates its System accordingly. Customers have access to these updated programs at a nominal charge.

The Homestead Farm Management System has a series of software packages which can be purchased independently to best suit your operation.

Accounting:

The basic Homestead package, designed to keep your books always in balance. Easy to use for the novice bookkeeper.

Resource Monitor:

Allows fine tuning for your accounting for more in-depth financial analyses. Includes Fixed Assets Records, Inventory Records, Resource Utilization Records and Cash Flow Planner. Available as a package or individually.

Crop Enterprise:

Provides for both record keeping and crop planning. Records are collected by crop year for up to 99 fields to give you a complete profit record by crop and field. The Crop Planner lets you vary your crops, acreages and inputs to project the most profitable combination.

Hog Enterprise:

A complete record keeping system available for farrowing, finishing or farrow to finish operations. Breeding, herd health and marketing are just some of the records that can be maintained. The Hog Planner allows you to project costs to weaning and/or costs to market so that you can make management adjustments to improve profitability. Least cost ration formulation is included in the planner.

Feedlot Enterprise:

The feedlot operator can make decisions based on three important areas: complete pen and lot records including details such as labor expense, feed costs and rates of gain; least cost rations and nutrient requirements; projected profits through a feedlot simulation exercise.

Beef Herd Enterprise:

A complete record keeping system which allows you to track the performance of all animals in your herd. You can more easily make culling decisions and monitor genetic improvements within your herd. The Calf Planner lets you simulate various management alternatives to project the most profitable route to calf production. A nutrition segment in this program allows formulation of least cost rations for the wintering cow herd.

Assessing A Farm Computer System

There are numerous computer systems on the market today. The number of options can be quite confusing. Not only are you faced with making decisions on the computer equipment (hardware) but you must also consider a variety of programs (software) promising to do the job.

Before you work your land you decide on the job that needs doing. Once you know the job, you decide whether you need a plow, a cultivator or a harrow. **Then** you choose the size and horsepower of tractor that is dictated by your equipment selection.

Approach your computer system purchase the same way. Decide on the job—what type of farm management information do you need? **Then** select the equipment (software) and **finally** decide on the horsepower (computer hardware). Just as a harrow can't double for a plow, software designed for urban small businesses can't be used to provide detailed farm management analyses.

Homestead Farm Management System

Financial Needs
Accounting
Resource Monitor
Fixed Assets
Resource Utilization
Inventory Monitoring
Inventory
Enterprise Records
Crop Records
Feedlot Records
Beef Herd Records
Hog Records
Planning
Cash Flow
Crop Profitability
Feeder Profitability
Calf Profitability
Cost to Weaning
Market Hog

When deciding on software consider its ease of use (user friendliness); its versatility; and its adaptability to other nonfarm-specific uses. And remember, not all software packages are compatible with all computer hardware.

We invite you to use the following check list when you comparison shop. We are confident you will discover how well Homestead can meet your needs now, and in the future.

FEATURE	HOMESTEAD	OTHER	OTHER
Overview			
Maximum operations accessible with one system	25 (Password protected)		
Menu-driven format	Throughout		
Checks for valid program & data files	Automatically		
Data integration between modules	Yes		
Reports available on screen or printed	Yes		
Training and support available	Yes		
Operating system compatibility	MSDOS & CP/M		
Minimum RAM requirement	64 K		
Minimum floppy capacity required	Dual floppy 320 K each		
Minimum print requirement	dot matrix 80 column with 132 selectable		
Compatible with sealed disc technology	Built-in to programs		

Homestead is a full line computer company. We design agricultural software, supply computer hardware and offer complete customer service.

Homestead Computer Services Ltd.

2979 Pembina Highway
Winnipeg, Manitoba
R3T 2H5
Telephone: (204) 261-6740
Telex: 07-587873

Homestead Computer Services (Alta.) Ltd.

Ste. 302, 1725 10th Avenue S.W.
Calgary, Alberta
T3C 0K1
Telephone: (403) 244-1717

Homestead Management Systems Inc.

2024 N.W. 92nd Court, Suite 1,
Des Moines, Iowa
50322
Telephone: (515) 225-0085

Printed in Canada

Exhibit 10

HOMESTEAD COMPUTER SERVICES LTD.

HOMESTEAD FARM FINANCIAL ASSISTANT LITERATURE

The Farm Financial Assistant

Farm financial planning used to mean a lot of figuring and refiguring, pencil pushing and paperwork. Now with the Farm Financial Assistant from Homestead you get the planning without the paperwork. The Farm Financial Assistant makes it easier and faster to produce your yearly financial plan of operation because the computer integrates data and performs calculations which are labourious to do manually.

Homestead has developed the Farm Financial Assistant to meet the financial needs of today's farmers.

Benefits:

The Farm Financial Assistant helps you run a better farming operation because it makes it easier to stay on top of your financial management. Since the computer does the work, you can invest your time in analyzing the results instead of spending your time doing endless calculations.

With the Farm Financial Assistant you can take information from your farm accounting and production records and put it into a format acceptable to, and understood by, your farm lender. The Farm Financial Assistant provides the framework necessary for sound farm financial planning applicable to all farms.

Since the Farm Financial Assistant handles the workload, you can prepare a more complete financial plan than you could manually. A well documented financial plan, as produced by the Farm Financial Assistant, substantiates your credit needs and indicates to your lender that you understand the importance of financial management.

With the Farm Financial Assistant not only is it faster to produce a comprehensive financial plan but it is also easier to test a number of planning alternatives or "what if" situations. You can quickly change figures and have the computer automatically do the calculations.

Since the Farm Financial Assistant maintains historical data, you can do year-to-year comparisons to measure the progress you are making as well as analyze what plan of action works best for your operation.

Features:

- user friendly
- provides completed reports understood by all lending institutions.
- includes: Statement of Affairs/opening position; budgeting for crop and livestock operations; annual summary of returns by enterprise; this year's projected and last year's actual operating expenses and receipts by enterprise; debt servicing calculator; monthly/quarterly cash flows.
- special mortgage calculator provides principal and interest breakdowns.
- maintains ten years of historical data storing 100 key financial/production statistics including 50 of your own choosing.
- designed to the format of the RoyFarm Financial Planner and Application for Line-of-Credit.
- comprehensive support package provided by Homestead which includes: toll free customer support line; warranty against defects for one year from date of purchase; renewable support package.
- operates on IBM and most IBM compatible hardware.

If you value your time, you'll value the Farm Financial Assistant.

Specially Designed:

The Farm Financial Assistant by Homestead is designed to match the specifications of the Royal Bank's RoyFarm Financial Planner & Application for Line-of-Credit. This program was developed with a great deal of advice from the Royal Bank of Canada. When you use the Farm Financial Assistant you are assured that your data is compatible with the formats used by your Royal Bank manager.

The Farm Financial Assistant is owned, manufactured and distributed by Homestead Computer Services Ltd. Homestead is the sole marketer of the Farm Financial Assistant software. Besides the Farm Financial Assistant, Homestead produces and markets a complete line of farm management software from accounting and financial recordkeeping to enterprise recordkeeping and simulation/planning packages.

Homestead is the major Canadian developer of farm software. The company has extensive experience in providing quality computerized solutions to the agricultural community.

TEACHING NOTE & PRACTITIONER GUIDE

HOMESTEAD COMPUTER SERVICES LTD

HOMESTEAD COMPUTER SERVICES LTD.

Teaching Note and Practitioner Guide

Synopsis

Homestead is a young Winnipeg-based firm specializing in the design of agriculture-related computer software. Although sales have been increasing over the past few years, the president feels that the company's growth has reached a plateau. Additional capital is now required to fund further software research and market development.

Due to the high-technology research and development nature of Homestead's business, the company has been unsuccessful in obtaining additional financing from conventional sources. Also, a large segment of their market (i.e. individual farmers) has been very slow to adopt computer technology. The president must now formulate a strategy to deal with these issues.

Objectives of the Case

1. To look at an organization in the intermediate stages of fund raising.
2. To consider the importance of government funding assistance.
3. To consider the option of stock market listing for an entrepreneurial company.
4. To consider the importance of demonstrating successful operation as a base for raising additional funds.

Questions

1. How has the company raised money to this stage of its existence?
2. What is the importance of government funding assistance?
3. What are the pros and cons of stock exchange listing?
4. How important is a record of success when going public?

Analysis

1. **HOW HAS THE COMPANY RAISED MONEY TO THIS STAGE OF EXISTENCE?**

Sheldon Fulton talks about the three stages of financing that he sees. First stage is the seed capital to get the business up and running. This was done with a sound business plan, venture capital, and some government assistance. The second stage involved gearing up production and establishing products and getting marketing established. As a research company they did not have sufficient internal funds. They raised equity by making successful presentations to potential investors, using some sweeteners such as stock options to offer participation in the company, and SRTC's.

This funding, however, had not taken Homestead to the point where they could finance future activities out of company profits. This left them with a requirement to raise additional capital. This task was made somewhat more difficult because of the fact that the company had not shown a record of profitability in the last couple of years.

2. **WHAT IS THE IMPORTANCE OF GOVERNMENT FUNDING ASSISTANCE?**

Mr. Fulton indicates that government assistance was important in both of the first two stages of the financing for his company. He said it was useful at the seed capital stages and again at the second stage where the SRTC program made it easier to raise money for the company.

Readers may want to discuss or debate whether or not they agree with Sheldon Fulton on the benefits of government financing assistance.

3. **WHAT ARE THE PROS AND CONS OF STOCK EXCHANGE LISTING?**

Pros include:

- It would give the company a higher public profile.
- It would enable going to the public market for more funds.
- It would make investment in the company more liquid. If this was the case, investors could either buy or sell shares more easily.
- There would be a certain status associated with being a publicly listed firm.

Some of the cons of seeking public listing would include:

- The cost associated with such listing.
- The fact that new equity investment would not automatically follow from a public listing.
- The fact that results would have to be made publicly available.
- The importance of a record of successful operations for funding.
- Concerns by current investors about dilution of their ownership.

4. HOW IMPORTANT IS A RECORD OF SUCCESS WHEN GOING PUBLIC?

One problem with any desire to raise money in the public market is the company's balance sheet. The record of losses in the last two years have left a significant deficit in operations. This poor record of financial performance in the last couple of years makes the company less attractive as a public investment. It would not stand in the way of getting listed on a stock market. However, it could limit the amount of money that could be raised in a public issue.

If the company anticipated having difficulty raising funds because of its performance record and because of concerns about dilution among existing shareholders', some alternatives might be considered. These could include taking the period of time necessary to achieve improved operating results, examining where the company is making money and/or losing money, or possibly going back to existing shareholders for additional funds.

Conclusions

The Homestead case demonstrates that a technologically advanced product and a large potential market do not necessarily guarantee a company's success.

Adoption of innovation by the consumer must be taken into account. Initially, Homestead overestimated the number of farmers who were prepared to use computers in their operations, and this resulted in lower than expected sales growth. It appears that acceptance by farmers of this new technology is a slow but steady process.

Investor Confidence is necessary. Bank financing may not be available to companies engaged largely in speculative development of new technologies, therefore other sources of capital must be found. Homestead must convince potential investors that, despite current losses, the company's future looks bright.

Selling and distribution methods must be considered. Homestead's high-tech products require an individualized sales approach, and customers usually demand a hands-on demonstration. In this way, the effectiveness of the company's sales force is limited. Compounding this problem is the wide geographic distribution of Homestead's potential customers.

Changes in Technology necessitate constant updating and development of new products. Homestead must be very careful not to fall behind in its R & D efforts. The company's software has to be compatible with new hardware products, and must remain competitive in both price and function with competitor's software.

In order to make a decision the reader must be aware of the various funding sources available to entrepreneurial ventures. The specific decision taken will depend upon the individual risk-taking nature of each person, but readers may be interested to know what did happen.

In the couple of months subsequent to preparation of case material the decision was made to not pursue a public stock exchange listing at this time.

The feeling was that it was important to re-establish a record of stable, positive earnings. The company pursued this by focussing upon their systems consulting activities which accounted for the substantial portion of their business and profits. The proprietary software was still pursued, of course, but greater emphasis and attention was to be placed upon the potential in the systems consulting business.

Volume

2

THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA

A Series of case studies

Vol. 2 Marketing Technological Products

(processes, issues, & problems)

Manitoba
Industry, Trade
and Technology

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TABLE OF CONTENTS

Foreword 2

1 Introduction 5

2 Sota Electronics Corporation 8

The Case Study 9

Exhibits 19

Teaching Note and Practitioner Guide 33

3 Wintec Electronics (A) 50

The Case Study 51

Exhibits 57

Teaching Note and Practitioner Guide 70

4 Wintec Electronics (B) 84

The Case Study 85

Exhibits 91

Teaching Note and Practitioner Guide 107

FOREWORD

ABOUT THE SERIES

Technological change is effecting the Manitoba business community in ways only dreamed of less than a generation ago. New, modern, technological innovations are being introduced at unprecedented rates. Increasingly, continuing entrepreneurial competitiveness seems dependent on the ability and willingness of individual businesses to identify and capitalize on technological innovations, and to adapt work methods, procedures, and operations to such innovations.

Recognizing the positive challenges inherent in identifying and assimilating technology into general use, the Technology Division of the Department of Industry, Trade and Technology, and the University of Manitoba, through the Faculty of Administrative Studies, cooperatively developed a series of Manitoba-based case studies addressing the management of technological change. The purpose for this joint venture was to foster awareness of technological innovations among business practitioners and business students, as well as to assist organizations manage technological change.

The series titled "THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA" comprises four volumes:

Vol. 1, Financing Entrepreneurial Ventures (stages, uses, & sources)
Cases: ABI Biotechnology Inc.
- financial crisis in raising development funding
- early stages of technological entrepreneurial ventures

Homestead Computer Services Ltd.
- strategies for long-term company growth: market development, new product selection
- financing long-term company growth

Vol. 2, Marketing Technological Products (processes, issues, & problems)
Cases: Sota Electronics Corporation
- developing a new technological product
- marketing a new technological product

Wintec Electronic (A)
- developing a new technological product
- reviewing R & D priorities
- marketing strategy

Wintec Electronic (B)
- production automation: analysis of marketing potential, cost effectiveness and expansion alternatives

Vol. 3, Worker Adjustment (managerial dilemmas, staff relations, and changing job functions)
Cases: Canadian Agricultural Services Limited
- impact of automation on staff relations
- impact of automation on job functions

Prairie Grain Producers
- managerial dilemmas and automation: fundamental problems and their effects on organizations from managerial perspective

Vol. 4, Automation: Robotics and Office Information Systems
Cases: Versatile Farm Equipment Company CAD/CAM System
- remaining competitive through automation
- acquiring a CAD/CAM system: factor and strategic analyses

Mid-West Garments Apparel Corporation
- reasons and conditions for considering new technologies
- importance of open-minded corporate attitudes

Quality Electrical Fixtures & Supplies Inc.
- management issues re: making effective use of information technology

The Technology Division had an editorial function in preparing these volumes

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ABOUT THE CASE STUDY METHOD

A case study is a sample of a real life situation; in this instance, a real life business situation. As a method of learning and teaching, the case study affords a unique opportunity for technological entrepreneurs, business practitioners, and business students to develop a better, perhaps fuller, understanding of a business situation which is of immediate or long-term concern to them. Through case study analysis and debate, as well as exposure to the experience and opinions of other entrepreneurs, practitioners, and students, participants learn several ways of looking at, thinking about and acting in a particular business situation. Hence, through indepth examination and diagnosis of situations comparable to their own, improved guides to action may be developed. (Reference: International Labour Office. (1972). An Introductory Course in Teaching and Training Methods for Management Development. Geneva: ILO Publications).

ABOUT THIS VOLUME

This volume comprises three case studies -- Sota Electronics Corporation, Wintec Electronics (A), and Wintec Electronics (B). Taken together, these three cases can be used to illustrate some of the processes, issues, and problems intrinsic to the development, automated production, and marketing of technological products.

The volume is primarily meant for two audiences, as follows:

1. Business practitioners seeking to develop and implement automated production and/or market technological products. Such practitioners may be associated with newly-formed companies or long-established ones.

2. Business students who are in the process of learning about processes, issues, and problems related to the development and marketing of technological products.

The volume is intended for use in a variety of settings. For example, a business entrepreneur, together with other key members in his/her organization, may elect to review the case studies as part of their decision making processes regarding the development and/or marketing of a new technological product or to discern potential problems and opportunities associated with entering a rapidly expanding, highly technical consumer product market. Business consultants could also use the volume as real-life subject material for technology seminars. Similarly, business educators could use the case studies to stimulate the thinking of their students.

ABOUT THE ORGANIZATION OF THIS VOLUME

This volume is organized into four major sections. Section 1 outlines the learning objectives. Section 2 includes the complete study of the Sota Electronics Corporation; Section 3, the Wintec Electronics (A) study; Section 4, the Wintec Electronics (B) study. Each section is further divided into two parts: the case study itself including exhibits and/or appendices, and the teaching note and practitioner guide.

Section 1

INTRODUCTION TO
VOLUME 2: MARKETING TECHNOLOGICAL PRODUCTS

INTRODUCTION

Volume 2 is made up of three case studies - Sota Electronics Corporation, Wintec Electronics (A), and Wintec Electronics (B). Taken together, these three studies can be used to illustrate some of the processes, issues, and problems intrinsic to the development, automated production, and marketing of technological products. Sota Electronics Corporation describes the development and marketing considerations of a small company's first proprietary new technological product. Wintec Electronics (A) describes the situation of an electronics manufacturing firm which, on a contract basis, developed a new product component only to discover that the contracting company has ceased marketing the system and does not intend therefore to place any production orders. Wintec must now evaluate the situation and decide what action to take regarding the product. Wintec Electronics (B) describes the marketing considerations of an industrial electronic manufacturing firm which, in order to remain competitive in the highly technological dish positioner field, must increase and automate production. Since management is unsure as to whether or not this rapidly growing consumer market is appropriate for the company, they must appraise both the size of the opportunity and the risks involved.

Objectives

As a package, these case studies can be used to meet the following objectives:

1. To illustrate some of the problems and decisions associated with moving a new technological product into the market place.

2. To illustrate some of the particular challenges faced by the small business technological entrepreneur who has limited knowledge and experience in marketing.

3. To illustrate some of the problems and opportunities associated with an industrial firm entering rapidly expanding, highly technical, consumer product markets.

4. To explore the steps of the new product development process.

5. To explore the need to priorize research and development activities and to balance technical and marketing activities.

6. To illustrate the kinds of analyses required in marketing a technological product and in analyzing corporate expansion alternatives.

7. To investigate issues of company strengths and weaknesses; market structure, size, and growth rates; market segmentation; buyer behavior; and technological change.

8. To explore the subject of company/product "fit", and the issues of product line diversity and the product life cycle.

9. To illustrate the effects of derived demand on an industrial marketer.

Section 2

CASE STUDY:

SOTA ELECTRONICS CORPORATION

SOTA ELECTRONICS CORPORATION[1]

In mid 1985 Mr. Carter Berezay, General Manager of SOTA Electronics Corporation, faced a new challenge -- how to market his new product, a computerized controller for regulating the environment (e.g. heating, ventilation) in poultry and swine barns. Together with four partners Mr. Berezay founded SOTA, which stands for State of the Art, in Winnipeg, in 1982. All the company's earlier design and manufacturing work had been custom ordered by a few specific clients, so marketing had not been a problem. The barn controller was SOTA's first proprietary product, with which the company hoped to make a significant entry into the agricultural market. "Our new product will soon be ready to launch," said Mr. Berezay. "We know it incorporates significant advantages over the mechanical and manual systems now in operation. The question now is how we can most effectively reach our target market with the controller."

Company Background

SOTA was a high technology company offering consulting, research and development, and manufacturing in microelectronics. The company was incorporated in 1983 with Carter Berezay as the major shareholder, owning 50% of the stock. The first nine months of the firm's existence were devoted to consulting work, in order to build sufficient capital to purchase development equipment and to hire engineers. (For Financial Data see Exhibits I and II).

In its initial year of operation, SOTA achieved sales of over $100,000 and the company launched into Stage 2 -- custom R & D and manufacturing. They concentrated on the agricultural industry, as the directors perceived a market niche in developing high technology products specifically for agri-business. Towards the end of 1984 the firm began development of the barn controller, and it was anticipated that this new product would be ready for commercialization by early 1986.

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[1] This case was prepared by Morva Bowman, M.B.A., under the supervision of Dr. Dennis Anderson, as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Copyright by The Case Development Program, Faculty of Management, University of Manitoba. Support for the development of this case was provided by the Canadian Studies Program, Secretary of State, Ottawa; and the Management Excellence in Small Business Program, Department of Industry, Trade and Commerce, Ottawa.

SOTA's staff and directors provided a good mix of capabilities for this venture. As General Manager, Carter Berezay had a background in management consulting and in agriculture, as well as a degree in agriculture and an M.B.A. He employed three electrical engineers specializing in microprocessors for system design and construction. The four directors of the firm included an expert in electronics manufacture and repair, an Agricultural Representative based in rural Manitoba, an agriculture specialist with a local consulting firm, and the regional manager of the agriculture department for a major bank. Three of them held degrees in agriculture, and two were also MBA's.

Much of the custom work done in SOTA's initial years had been related to agriculture. Projects included the design of a computer-based livestock feed mixing system, a computerized production scheduling system for an agricultural manufacturer and development of a software program to optimize blending of different batches of cleaned seeds. The firm had also custom designed a computerized drug administration system for hospitals and nursing homes, as well as working with plant growth chambers, dog kennels, and glass washers.

The barn controller represented the first step in achieving SOTA's long term goal to manufacture their own microelectronic products for the agricultural market. While consulting and custom manufacturing would continue to be part of the operation, producing proprietary products would provide SOTA with greater opportunities for expansion and some protection from the ups and downs of custom work.

While Mr. Berezay recognized that industries tied to agricultural markets could be extremely cyclical, he felt that there were specific target areas which were much more stable. "Segments of agri-business are doing fine even in a general slump -- these are the ones that are protected.[2] The poultry is protected, and to a degree hogs soon will be, so these are our targets. Especially poultry - a business with built-in profit margins, with cost of production formulas, quotas, etc. The poultry business is quite insulated from the ups and downs of normal ag business. Eventually grain is going to come back, beef might, and we hope to be ready with a product or two to introduce into those markets. For now we will go with protected markets which give us the best opportunity to sell on a steady basis."

Development of the Electronic Barn Controller

The idea for the SOTA barn controller originated during interaction on consulting projects with farmers involved in the poultry business. Further discussion with agricultural engineers, farmers and swine and poultry experts helped to clarify the problem and produce an initial list of specifications. Work began on the controller in 1984, after the company received partial project funding from the National Research Council under the Industrial Research Assistance Program (IRAP), to assist with design and development costs.

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[2] Poultry and hog production and marketing activities were controlled by marketing boards in most provinces (e.g., The Manitoba Hog Producers Marketing Board). Marketing boards were designed to stabilize both supply (production) and market prices for livestock.

Further funds were acquired on September 1, 1984 when SOTA Electronics sold a Scientific Research Tax Credit (SRTC) in the amount of thirty-five thousand dollars ($35,000). Preferred shares were issued with the tax credit. These preferred shares had the following features: 8.75% annual dividend paid quarterly, cumulative, non-voting, callable at 100.0% not before August 31, 1986. The funds were used to purchase research and development equipment and fund product development. The SRTC was sold to current common shareholders and related individuals. Attached to the tax credit was an option for individuals to purchase a total of eight thousand nine hundred seventy (8,970) Class A common shares. This option expires August 31, 1986.

The Need for SOTA's Product

A confinement barn houses livestock raised from birth or weaning to marketable size. The animals are housed for a relatively short time period, generally six months or less. During that time they are fed maximal amounts to induce rapid growth, and confined in a limited space to prevent excessive movement, which toughens the meat.

"A confinement barn is virtually a sealed unit," Mr. Berezay explained. "It is vital to control the internal environment of the barn in order to optimize growing conditions for the livestock. The design of barns is similar for both hogs and poultry. Exhaust fans, heating equipment and lighting are the basic component equipment systems for this type of barn."

The SOTA controller would meet an existing need for accurate control of the barn systems. The microprocessor monitored heating, fans, and ventilation inlets, and provided integrated control of all aspects of the barn's internal environment.

Current Systems

Presently, most barns were controlled with "on-off" electro-mechanical technology. Systems involved would include lighting, heating, exhaust fans, ventilation air inlets, and possibly smoke or heat detectors and alarms. Each system was separately managed; the operator set an electro/mechanical control or timer for each function, for example, raising and dimming lighting, opening and closing air inlets, turning fans on and off, or regulating temperature. (See Exhibits III and IV for sample layouts).

Such systems perform the essential functions of maintaining the desirable temperature and air quality in a livestock barn, and were standards throughout the industry. They meet basic insurance requirements and had the advantage of being relatively low cost. A complete set up of electro-mechanical controllers for air inlets, fans, and heaters would cost the farmer about $4,000 installed.

However, there were a number of problems involved with such simplified and separated systems. Energy costs for heating and ventilation were high and of significant concern to livestock operators, particularly poultry operations. Because there was no inter-connection of the two systems, and no integrated feedback/control mechanism between them, it was not uncommon for both heating equipment and exhaust fans to be operating at the same time. An Alberta government study showed that a reduction of up to 50% of energy costs could be achieved by using a computerized control system in confinement barns. This would mean savings of approximately $3,000 - $5,000 per year for the average farmer.

The aim of a confinement barn was to provide an optimum environment for the livestock in which feed will be most efficiently used by the animals, resulting in a lowered cost of feed per unit of animal weight. Current operating systems provided only an approximation of the desired environment, as each system operated independently and within a set range of conditions. For example, heating could be set to turn on when the temperature drops below 15 C, and to turn off when it rose above 25 C. Exhaust fans were similarly regulated, and ventilation inlets were preset to a specific size and manually altered by the operator when severe weather changes occurred. However, precise control of the exact temperature was not possible without continuous operator attention.

Operator stress was another significant problem in the management of confinement barns. Power failures or sudden drastic temperature changes could be fatal to the farmer's entire stock, but due to the nature of the business, the operator could not be present at all times to monitor for critical conditions. Although many systems incorporated heat or power failure alarms, these were triggered only when the crisis occurred, and it was not always possible to locate and correct the problem in time.

The SOTA Controller

The SOTA Barn Controller was unique in providing control/management of barn environment systems as opposed to the simple "on/off" switches manually operated by the farmer which are the current industry norm.

In order to control an environment effectively, the controller would also have to be capable of monitoring it and of processing the results obtained. Several temperature sensors were located throughout the barn and the average measured temperature was compared against desired conditions. The SOTA system then adjusted heaters, exhaust fans, or air intakes as necessary. Heaters were divided into continuous use heaters and supplementary heaters, the latter to be regulated by the controller as required. Similarly, fans were divided into standby fans and a separate secondary fan bank or "banked" exhaust fans which were deactivated in winter. Standby fans were individually controlled for cooling and ventilation. The secondary "banked" exhaust fans were turned on for increased air flow during warm weather. Air intakes were controlled by a motor driven pulley system. (See Exhibit V for sample layout).

The SOTA controller only controlled some of the fans and heaters. Others were manually set. This partial control feature increased safety; in the event of controller breakdown some fans and heaters would still be operative by manual control.

To reduce management stress the controller monitored the barn power supply (and if desired, the feed and watering system and the fire alarms) and activated alarms if faulty conditions occurred. The controller maintained battery backup, and all alarm conditions even if self-corrected, were logged by the controller to produce a record for the operator to view and become informed about any system alarm history.

The controller could also provide timed lighting control without inconveniencing the farmer. In the case of poultry production, the birds could be induced to eat more, but expend less energy if they had a shorter day/night cycle. A further feature was a de-icing cycle on the exhaust fans, activated when the outside temperature fell below +35 F. (Ice buildup was a recurring problem that could cause motor burnout.) This feature permitted the operator to select specific fans, to select the duration of deicing powerup and to determine the interval between deicing cycles. The controller would then automatically run the programmed cycles.

The SOTA controller was operable in many different production setups, and could be connected to existing and installed motors, heaters, and lights. One controller can operate up to two independent production units, and the number and designation of active control outputs was programmed (defined) by the user or installer at the time of installation.

Technically, the barn controller was modular in design, allowing easy servicing and expansion. It consisted of four to six card modules, plugged into a standard interconnecting system and linked to a microcomputer including the Central Processing Unit, Random Access and Read Only Memory, Timer, Keyboard and Display.

The Marketplace

In developing the barn controller, SOTA researched the market carefully. Mr. Berezay explained:

> Farmers are becoming increasingly sophisticated and computers are often used in farm record management, so a microprocessor-based technology is at least somewhat familiar to the majority of our prospective customers. This means that we should not have to worry too much about educating the market.

> The controller is suitable for both poultry and swine barns, but especially poultry. At least, poultry is the initial target, since swine farmers are not doing so well at present. Poultry is a smaller market but I think we can get a larger share of it.

Discussions were held with poultry producers, hog producers and the Manitoba Department of Agriculture (MDA). Within the MDA the Swine, Poultry and Technical Services branches were very helpful, and representatives from these areas felt that SOTA's controller incorporated significant improvements over existing electro/mechanical systems. A member of the Technical Services Department summed up the advantages of the SOTA product as follows:

> It permits more precise environmental control, and the interlocking of the heating and ventilation system improves energy efficiency. The controller's ability to log relevant environmental data for the operator to study is a desirable aspect, and the deicing protection for fans is an excellent new feature. The use of integrating sensors smooths the whole operation of the facility and, using the microprocessor, the controller should be able to anticipate changes in the environment and deal with them before they reach a crisis point.

The MDA provided statistics on probable market size by type of stock (See Exhibits VI, VII and VIII). Information on U.S. producers was difficult to obtain, but some total production figures were available. In poultry, the U.S. in 1984, produced 4,500 million broiler chickens. Major production occurred in the Southeastern states. In addition, there were 278 million layers and the top four states were California (34 million), Indiana (19 million), Georgia (18 million) and Pennsylvania (16 million). U.S. turkey production for 1984 totaled 171 million, with North Carolina (30 million), Minnesota (28 million) and California (20 million) leading the way.

U.S. swine produced in 1982 totaled 53,230,000; 61% of that total were produced in the corn belt states (Illinois, Indiana, Iowa, Missouri, Ohio). These states were the traditional centers of hog production in the U.S., with 43% of all producers in the nation. Minnesota, Missouri, and Nebraska were also significant hog producers.

Competition

Two types of competition faced the SOTA controller. The "state-of-the-art" for the industry were electro/mechanical controllers, well proven but, as mentioned earlier, not very precise. These retailed for about $4,000. Mr. Berezay felt that SOTA's new product offered distinct benefits to the farmer, but it would be an additional purchase, connecting to the actual fans, heaters, etc. SOTA's controller was to be priced at about $8,000 to the end user.

Programmable Logic Controllers (PLC's), used for various repetitive industrial functions such as machine controls, could also be programmed to handle confinement barns. However, they would each require custom programming, and would thus be very expensive when compared with a "dedicated barn controller" such as SOTA's product.

There were several other competitive products. A fan control system (called Chore-Time) manufactured in the U.S. automatically varied fan speed according to changes in temperature and ventilation in the barn. It sold to the farmer for about $700. (See Exhibit IX). The Alpha Environment Controller (See Exhibit X) monitored temperature and controlled fans, heat, and alarm systems in the barn. This system offered less sophisticated control than the SOTA product, and required more manual intervention. The MCOI-TA Alpha sold for about $350; each slave-unit for fan or temperature sensing cost an additional $60. Mr. Berezay did not have detailed knowledge of how these competitive products were marketed. However, he understood that the Chore-Time product belonged to a sizeable agricultural sector electrical and mechanical equipment manufacturer whose products were distributed throughout North America. While he could explore using one of these "competitive" firms as his "marketing arm" he felt it was better to try to do his own marketing.

Marketing Plans

In the spring of 1985, after approximately four months of initial design and prototype construction, bench tests were successfully performed on the barn controller units. Future plans called for the units to be installed and tested in typical poultry and swine operations over a several month period in the fall of 1985. This was to be followed by redesign to improve details and iron out any remaining problems and by a further field test period to ensure that the controller would perform as specified under a variety of weather conditions. Mr. Berezay anticipated that the product would be ready to market by early 1986. However, he felt he must begin work to prepare a plan for marketing the product.

Mr. Berezay felt that the greatest marketing problem was to achieve distribution of the controller throughout Canada and the U.S.A. End-users in the agricultural industry tended to view electronic products as undesirable because of a lack of local dealer service and support.

To overcome this problem, he considered establishing distribution through rural electricians, who would be installing the units. The end user would have more confidence in the system because his electrician had installed the unit and could service it. Benefit selling would have to be used to convince electricians to carry the controllers. The benefits would include special one-day training seminars to make them thoroughly familiar with the product, a good sized market including both new confinement barns and retrofit potential, and the opportunity to make money on the installation. The equipment was easy to install and program; it was self-diagnosing to a large extent and, due to its modular design, would be easy to service. It would be backed up by a detailed instruction manual.

SOTA planned to sell to the dealer at a price of $6,000 with a suggested retail price of $8,000 installed. Since installation should take approximately two days, the electrician should make a $2,000 fee for two days work. In addition, as a particular dealer's sales increased, SOTA planned to offer a sliding discount scale -- 10% on units 2-5, 15% on units 6-10, etc. This would provide additional incentive for the electrician to act as dealer.

In Manitoba in 1985 there were approximately 400 rural electrical contractors, ranging from single person operations conducted as a sideline, to farming, to large full service businesses. About 200 would employ two or more people. Contractors normally offered repair services and installations of new residential, commercial and agricultural electrical systems. They would carry a normal service inventory of wires, cables, connectors, etc., and the large businesses might carry small inventories of common electrical items such as: baseboard heaters, timers, lighting fixtures, etc. Larger quantities, as needed, would be purchased through distribution outlets in Winnipeg, Brandon or Dauphin. Promotional efforts of electrical contractors were minimal -- an ad in the phone book or occasionally in the local paper, and perhaps some point-of-sale advertising. Most products were promoted by the manufacturers, in appropriate print media or through direct mail. Occasionally, a manufacturer would engage the contractor in promotional activities on a co-op basis. On most small dollar products carried by the contractor, the retail margin was between 30-40% although they might take much less on a very high priced product like SOTA's.

There were approximately 12 major distributors of electrical supplies operating in Manitoba. All were headquartered in Winnipeg, and only a few had branch outlets in Brandon, Dauphin, or The Pas. Typically, distributors employed a company sales force to call on the large electrical contractors. Smaller contractors would generally order by phone, mail, or in person from their nearest distributor outlet. Distributor's margins were generally 20-25% on most electrical supply items. SOTA could go directly to the electrical contractors, or it could deal with distributors.

A third alternative would be to deal with distributors of agricultural equipment. There were about a dozen major suppliers located in Winnipeg and southern Manitoba, who carried existing heating and ventilating systems, as well as feed, watering and waste handling equipment and other confinement barn supplies. These businesses sold direct to the farmers in their office area, and also through a network of rural dealers. The supplier paid a 25% markup on the manufacturer's cost and marked most items up another 25% for resale to dealers. Markups of 35-40% were used if selling direct to the farmer. Products were promoted through advertising in local papers, farm trade papers, and presentations at trade shows.

Many feed mills also carried this type of equipment as a side line. They would obtain leads through the company feed salesforce, which was in regular contact with farmers. The information was then followed up by a salesperson dealing specifically in agricultural equipment. In this way feed mills would make about 85% of their equipment sales directly to farmers. The remainder were through dealers who received a 10% commission on most items. Manufacturer's markup was again about 25% on cost, and the feed company then marked up the product about 45% or slightly less on large dollar items.

One supplier commented: "Being local is very important in this business. The farmer wants to talk to a local expert -- one of our dealers, myself if we're close enough, or his feed salesman. They also make a lot of use of the government Agriculture Representative."

In 1985, with most segments of the agriculture market depressed, suppliers identified price as a major factor in farmers' decisions. "If the market is good, they don't mind spending for quality," explained a dealer. "But lately they just can't afford the top line stuff, and will make a conscious decision to trade off some durability for price. There's a lot of comparison shopping -- no loyalty to a brand or a dealer. Most buyers will get a proposal from four or five different sources, and then pick out the parts they like best from each one."

Most sales were made through the supplier presenting a proposal for a system layout, after which the farmer would negotiate for improved prices on specific parts. Formal bidding systems were used only for government contracts. Although almost half of the Manitoba pork industry was controlled by integrated corporations or Hutterite Colonies, the purchase decisions remained highly individual, with only one or two persons involved. Hierarchical proceedings or buying committees were virtually unknown.

New construction of confinement barns followed the same cycle as the agriculture industry as a whole. Every four to five years, when sales were good, there would be a boom, with 15-25 new barns being built in Manitoba. This was followed by several years in which equipment was only repaired or replaced as necessary. In 1985, it was expected that very little new construction would be taking place in Manitoba over the next two or three years.

In order to introduce the controller to its target market, SOTA planned to utilize booths at four major agricultural trade shows, to take place in November and December of 1985 and June and July of 1986. This would give the controller exposure in both eastern and western Canada, at a cost of approximately $2,000 for each show. Mr. Berezay budgeted an additional $6,000 for promotional brochures to be distributed at the shows and used for direct mail advertising. Mr. Berezay commented: "A direct mail campaign combined with advertising in major trade publications should generate some market pull -- I feel I would have to spend about $12,000 in order to obtain a reasonable level of saturation."

The expected dealer price of the controller, ($6,000) allowed a very good margin for SOTA, and at a final installed price of $8,000, the farmer could expect to recoup his initial investment reduced energy costs within about two years. SOTA's direct labour and material costs would be about $2,000 per unit, and the overhead and administrative costs to be allocated to the controller for 1985 were estimated at about $85,000. Mr. Berezay expected that by August 1985 the firm would need to add a full time marketing person, at a salary of perhaps $20,000 per year. He was seeking investors interested in putting up $100,000 to cover initial marketing and startup production costs, in return for some form of investment tax credit. Although the

Scientific Tax Research Credit plan under which the original SOTA financing was obtained had been discontinued by the federal government, other incentive programs were still in operation.

Future New Product Plan

SOTA was also pursuing the development of two other new technical products. An electric current sensor that was able to determine when an electric motor was on or off was expected to be developed, tested, and ready for market by mid-1986. It could be marketed as a tie-in with the barn controller to which it would add the features of being able to monitor the watering and feeding systems. The sensors would have a variety of other applications, and SOTA expected that their product could retail for approximately 20% less than existing units.

Once the barn controller was into full time production, SOTA planned to begin development work on a parturition monitor system for large animals. It would take at least one year to bring this product to market. The system would be capable of monitoring the onset of the birthing process in large animals in order to warn the livestock producer when birth was in progress so that the birth could be assisted, if necessary. The key to this system was the fact that, prior to giving birth, virtually all cows lifted their tails to a completely horizontal position -- far higher and for a longer time than the tail would be raised for dunging or normal wagging. A small mercury switch containing two electrodes could be attached near the base of the tail. When the cow raised its tail to the appropriate position, a signal would be transmitted to a central receiving station, sounding an alarm to alert the farmer. Such a product would minimize livestock losses during the birthing process; as well, it would reduce veterinary fees. No such product had appeared to date, and Mr. Berezay felt that the market prospects were good.

Development of these projects would require additional cash of $20,000 to $30,000 so it was particularly important to Mr. Berezay that the electronic barn controller generate a positive cash flow very rapidly. He felt that the controller would be proven in the field and ready to market by early 1986, so he had to finalize promotional plans, find financing and arrange distribution in the near future. He wanted to have "all systems Go" by early 1986.

EXHIBITS:

SOTA ELECTRONICS CORPORATION

EXHIBIT I

SOTA ELECTRONICS CORPORATION
{Incorporated under the laws of Manitoba}

BALANCE SHEET

DECEMBER 31, 1984
{with comparative figures as at December 31, 1983}
{Prepared without audit}

	1984	1983
ASSETS		
Current assets:		
Cash		$ 408
Short term deposits		18,748
Accounts receivable	$17,326	17,683
Inventory	28,158	4,434
Prepaid expenses	964	117
	46,448	41,390
Fixed assets	12,174	8,823
	$58,622	$50,213
LIABILITIES		
Current:		
Bank overdraft	$ 7,786	
Accounts payable and accrued charges	8,916	$14,358
Due to related party		9,022
Due to shareholders	5,156	
Current portion of long-term debt		2,959
Income taxes payable	2,995	1,700
Deferred taxes payable		100
	24,853	28,139
Long-term debt, less current portion		6,349
Shareholder's equity:		
Share capital	41,700	2,300
Retailed earnings {deficit}	{7,931}	13,425
	33,769	15,725
	$58,622	$50,213

EXHIBIT II

SOTA ELECTRONICS CORPORATION

STATEMENT OF INCOME AND RETAINED EARNINGS

YEAR ENDED DECEMBER 31, 1984

{with comparative figures for the nine months ended December 31, 1983} {Prepared without audit}

	1984	1983
Revenue	$182,412	$97,002
Expenses:		
Expenses other than interest and depreciation {schedule}*	182,395	80,728
Interest on long-term debt	382	410
Depreciation	3,638	639
	186,415	81,777
Income {loss} before income taxes	{4,003}	15,225
Income taxes		
Current	3,100	1,700
Deferred	{100}	100
	3,000	1,800
Net income {loss} for period	{7,003}	13,425
Retailed earnings, beginning of period	13,425	
	6,422	13,425
Deduct:		
Excess of consideration paid over stated value of shares re-acquired	{13,500}	
Dividends paid	{853}	
	{14,353}	
Retained earnings {deficit}, end of period	$ {7,931}	$13,425

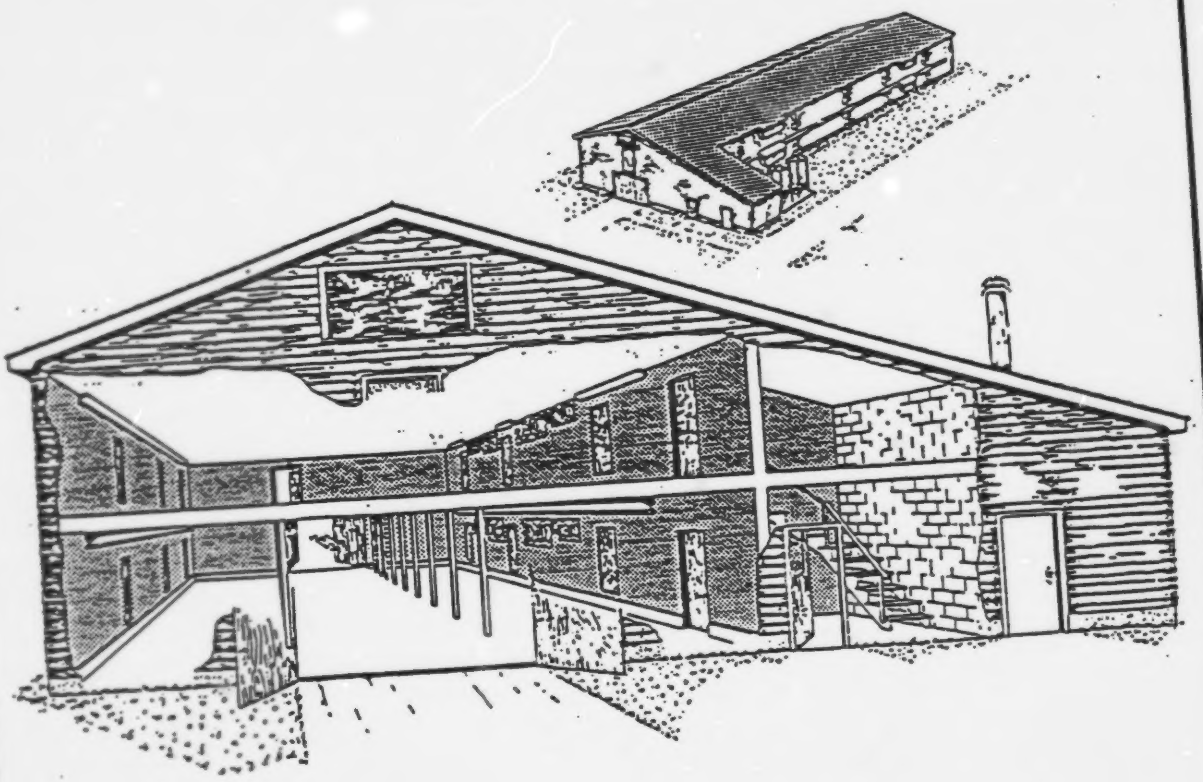
*Schedule

	1984	1983
Business and property taxes	$ 748	$ 903
General and administrative	11,664	12,870
Miscellaneous	606	937
Professional fees	2,728	1,000
Purchases	22,789	9,022
Rent	4,050	150
Research and development	63,803	10,169
Salaries	74,259	44,910
Utilities	1,748	767
	$182,395	$80,728

EXHIBIT III

PLAN
5318

TWO-STORY POULTRY BROODER UNIT



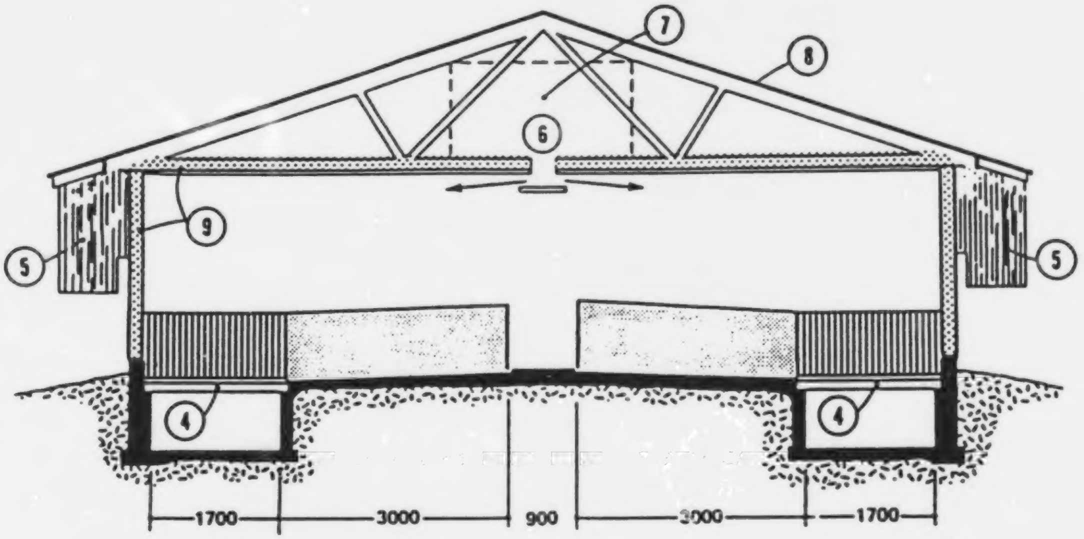
CANADA
PLAN SERVICE

The Canada Plan Service prepares detailed plans showing how to construct modern farm buildings, livestock housing systems, storages and equipment for Canadian Agriculture.

This leaflet gives management information and describes one of these detailed plans. To obtain a copy of the Canada Plan Service detailed plan, contact your local provincial agricultural engineer or extension advisor.

EXHIBIT IV

GROWING/FINISHING BARN WITH MECHANICAL VENTILATION, PART SLOTTED FLOORS


7
8
6
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5
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4
4
1700
3000
900
3000
1700

1 vestibule, with pig sorting and loading, heating, electrical & watering equipment
2 self-feeder, or feed on floor
3 pens 4.8 to 2.4 m wide, 4.8 m long
4 slotted floor
5 exhaust ventilation fans
6 double-slot adjustable fresh air inlet from attic
7 summer attic ventilation doors, both ends
8 white or insulated roof
9 insulated walls and ceiling

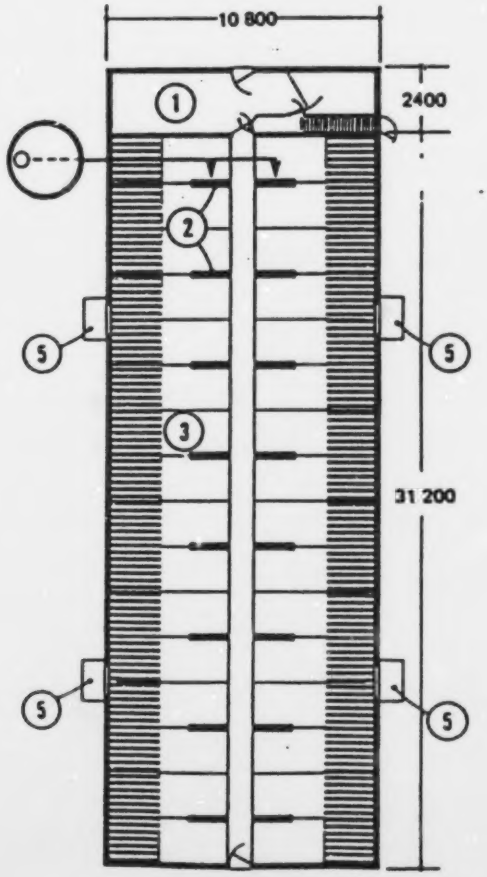
10 800
2400
1
2
5
5
3
31 200
5
5

EXHIBIT V

A TYPICAL CONFINEMENT BARN LAYOUT

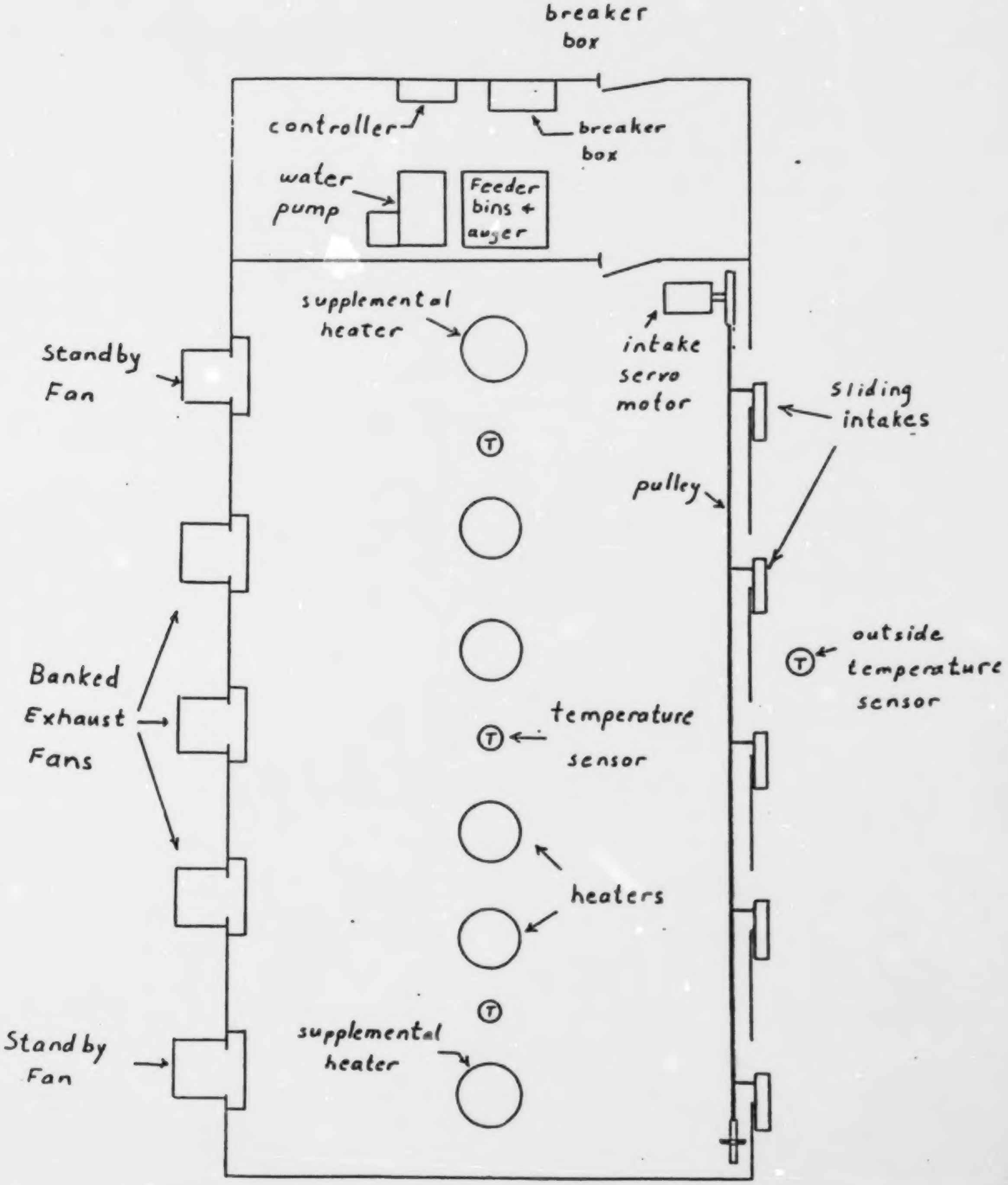
breaker box
controller
breaker box
water pump
Feeder bins + auger
supplemental heater
intake servo motor
Standby Fan
sliding intakes
pulley
Banked Exhaust Fans
outside temperature sensor
temperature sensor
heaters
Stand by Fan
supplemental heater
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EXHIBIT VI
SWINE PRODUCTION DATA

(A) Manitoba Hog Producers' Marketing Board (MHPMB) - Production Units by District (also see accompanying map of MHPMB districts)

MHPMB District	Number of Active Production Units 1983	1982	1981	1980
#1 Southern	528	527	632	736
#2 West-Central	345	347	451	558
#3 North-Central	366	352	421	532
#4 North-West	354	348	458	597
#5 Central Plains	649	627	698	756
#6 Interlake	292	287	331	379
#7 Red River East	663	648	697	724
#8 Hutterite Colonies	74	72	71	70
TOTAL	3,271	3,208	3,759	4,352

(Source: MHPMB Annual Reports)

(B) Provincial Time Trends in Number of Producers and Average Marketings

	TOTAL NUMBER OF PRODUCERS				PIGS MARKETED/PRODUCER			
Year	Quebec	Ontario	Manitoba	Alberta	Quebec	Ontario	Manitoba	Alberta
1966	30,683	41,827	16,048	28,544	52	62	37	47
1971	17,428	30,626	14,201	26,204	110	102	94	77
1976	8,363	17,421	5,878	12,200	279	146	139	89
1981	3,000	10,000	3,759	5,700	1,639	382	297	296

(Source: The Swine Industry: Changes and Challenges, H.T. Fredeen and B.G. Harmon, Journal of Animal Science, Vol. 57, Suppl. 2, 1983.)

(C) Canada - Swine on Farms - By Province (1976)

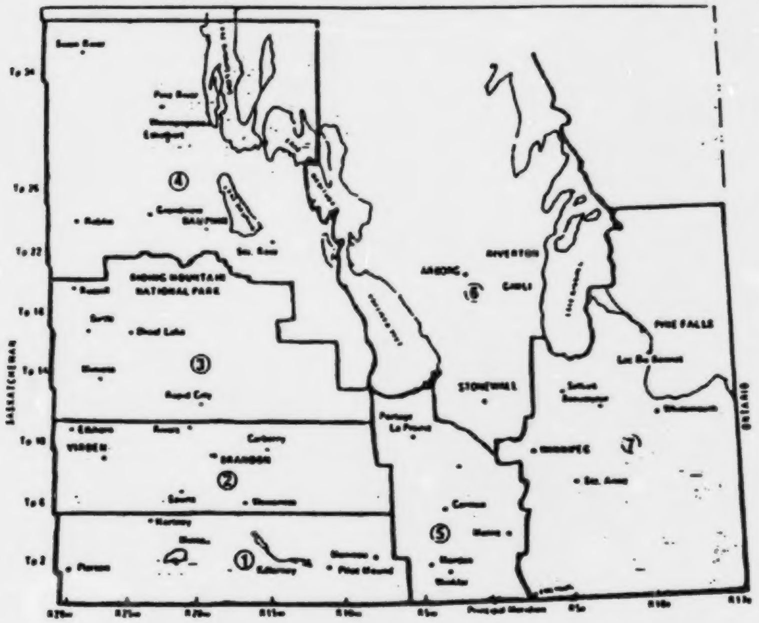
PROVINCE	NUMBER	FARMS REPORTING
British Columbia	53,014	1,440
Alberta	876,283	12,200
Saskatchewan	490,388	12,114
Manitoba	624,951	5,878
Ontario	1,904,446	17,421
Quebec	1,613,139	8,363
New Brunswick	39,317	762
Nova Scotia	72,714	606
Prince Edward Island	78,124	1,078
Newfoundland	15,703	49
Total (Includes Yukon & N.W.T.)	5,768,089	59,914

Note: This is Stats Can Census Data and includes all sizes of farms, including many too small to use confinement barns.

MAP TO ACCOMPANY EXHIBIT VI

MHPMB district map and production breakdown for 1983

The following is a sketch map of the Province showing MHPMB District Boundaries.


④
③
②
①
⑤
⑥
⑦
DAUPHIN
RIDING MOUNTAIN NATIONAL PARK
Rapid City
VIRDEN
BRANDON
Carberry
Souris
Killarney
Pilot Mound
Portage La Prairie
Carman
Morris
ARBORG
RIVERTON
GIMLI
STONEWALL
WINNIPEG
Ste. Anne
PINE FALLS
Lac Du Bonnet
Whitemouth
SASKATCHEWAN
ONTARIO
Principal Meridian
Tp 26
Tp 22
Tp 18
Tp 14
Tp 10
Tp 6
Tp 2

MHPMB DISTRICT MARKETINGS — 1983				
MHPMB DISTRICT	NUMBER OF ACTIVE PRODUCTION UNITS		TOTAL MARKETINGS	
	1983	1982	1983	1982
#1 — Southern	528	527	138,830	131,010
#2 — West-Central	345	347	56,792	57,892
#3 — North-Central	366	352	56,452	46,894
#4 — North-West	354	348	39,538	38,373
#5 — Central Plains	649	627	199,444	181,415
#6 — Interlake	292	287	89,568	80,310
#7 — Red River East	663	648	326,234	293,463
#8 — Hutterite Colonies*	74	72	373,954	348,722
TOTAL	3,271	3,208	1,280,812**	1,178,079**

*District 8 is not defined by boundaries but encompasses all Hutterite Colonies in the Province that are duly registered as hog producers.

**Includes only hogs sold by registered hog producers in each of the eight MHPMB districts.

EXHIBIT VII

POULTRY PRODUCTION DATA

(A) Manitoba Poultry Industry - Number of Products - By Region (1980)

REGION	EGG PRODUCERS	PULLET PRODUCERS	BROILER PRODUCERS	TURKEY PRODUCERS	TOTALS
Northwest	6	3	0	2	11
Southwest	20	12	9	6	47
Central	103	50	19	16	188
Eastern	98	58	86	32	274
Interlake	22	11	5	25	63
TOTALS	249	134	119	81	583

(Source: Commodity Profile - Poultry in Manitoba - D. Waddell, MDA, Animal Industry Branch)

(B) Canadian Poultry Industry - Number of Registered Producers - by Province (1977/78)

PROVINCE	EGG PRODUCERS	BROILER PRODUCERS	TURKEY PRODUCERS	TOTALS
B.C.	218	215	48	481
Alta.	326	127	56	509
Sask.	123	91	26	240
Man.	265	119	100	484
Ont.	1,004	817	229	2,050
Que.	355	1,089	231	1,675
N.B.	39	38	14	91
N.S.	63	68	12	143
P.E.I.	48	1	-	49
Nfld.	38	15	-	53
TOTAL	2,479	2,580	716	5,775

(Source: Organization and Structure of the Poultry Industry in Manitoba and Canada - D. Waddell, MDA Animal Industry Branch)

EXHIBIT VIII

CONFINEMENT BARNS - ESTIMATED NUMBERS

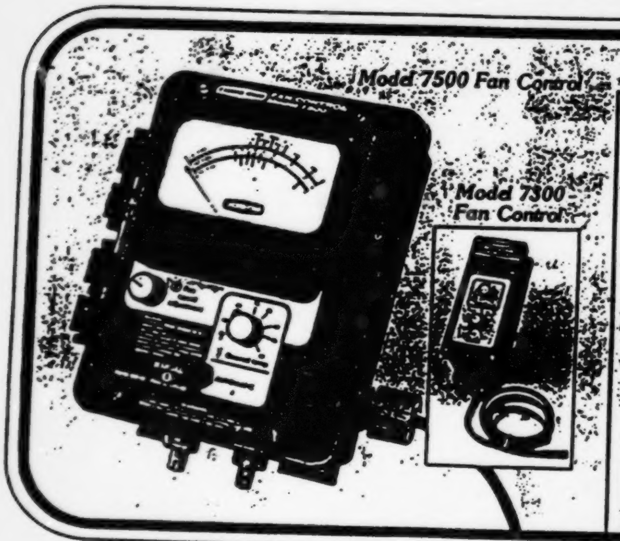
Swine Barns:	Canada	31,670	U.S.A.	79,200
Poultry Barns:		7,820		19,550
Total Estimated Confinement Barns		138,240		

(MDA Estimates - 1984)

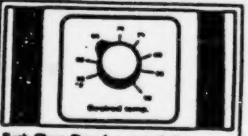
CHORE-TIME

EXHIBIT IX

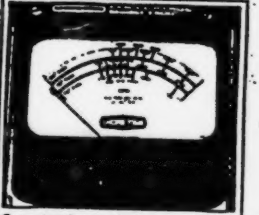
New CHORE-TIME®
Model 7500 & Model 7300
fan controls



FEATURES



Both Chore-Time fan controls have easy-to-read temperature settings. Both units also have remote temperature sensing capability and can be used with up to 500-ft. sensor cord.



Convenient fan speed adjustment allows operator to easily minimize winter over-ventilation and heat loss for greater efficiency. Model 7500 features easy-to-read CFM meter (shown).

Built-in fuse protection for electronic components drastically reduces the possibility of control failure. Model 7500 offers indicator lights (shown) to signal a blown fuse.

FUNCTION
Controls fan speed automatically

Both the Chore-Time Model 7500 and Model 7300 Fan Controls are designed for reliable use in livestock buildings where the building temperature can not be easily maintained thru the use of thermostat controls. Fan controls are used to vary fan speed as ventilation requirements and temperatures change in the building. This means you can coordinate your ventilation system with the heating system to reduce heat loss in winter.

FACTS

Both fan control models include:

- Non-metallic, non-corrosive, water- and dust-proof housing that meets the new strict electric codes
- Fan speed changes gradually and smoothly with temperature changes to eliminate stresses caused by sudden changes in tem-
- Designed to operate more than one Chore-Time fan at a time, if desired.
- Choice of manual or automatic operation of fans.
- Controls have field-replaceable components for added convenience

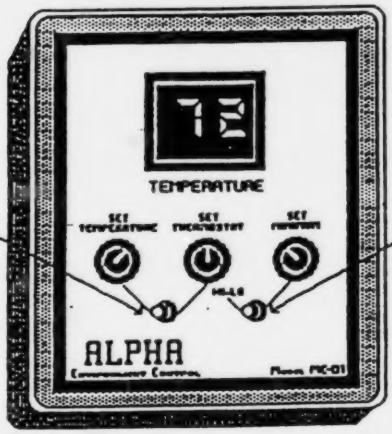
In addition, Model 7500 Fan Control features:

- CFM meter allows air flow for Chore-Time's 14", 18", or 24" fans to be read directly.
- Manual/automatic switch for easy choice of control operation
- Lighted fuses with easy access

EXHIBIT X

ALPHA Environment Controller

General Instructions


72
TEMPERATURE
SET TEMPERATURE
SET THERMOSTAT
SET
HI-LO
ALPHA
Environment Control
Model MC-01

SET TEMPERATURE

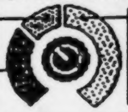
HOLD THIS SWITCH to the LEFT ←— ◑. The LEFT LED will come on. While turning the "Set Temp" knob and watching the DISPLAY, adjust to your desired Ventilating Temperature, then release switch.

SET MIN. SPEED

HOLD THIS SWITCH to the RIGHT ◑ —→ activating RIGHT LED. Adjusting Min. Speed knob changes LED flash:
NO LED FLASH = min. off
Slow " FLASH = min. slow
Fast " FLASH = min. fast
Pulsing Flash = PULSE MODE
(See Diagram)

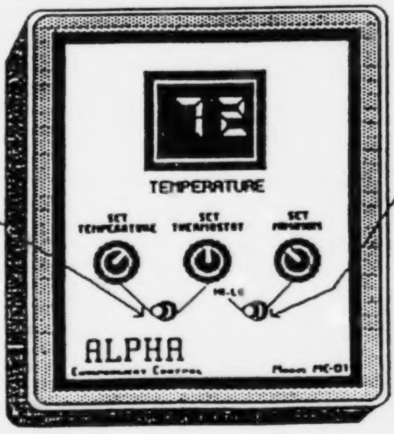
APPROXIMATE RANGE FOR SET MIN. SPEED CONTROL

Approx. min. off position. No LED flash. Fans go to OFF if temperature falls low



Approx. PULSE mode position. Fans will go to min. off, but will be pulsed on full power every 5-6 minutes for 5-sec. Use to prevent fan motor freezing in cold weather.

Approx. variable min position. Slow LED blink means slow fan min. speed. Faster LED blink means faster minimum fan speed. Fans will not shut off when temperature falls low.


72
TEMPERATURE
SET TEMPERATURE
SET THERMOSTAT
SET
HI-LO
ALPHA
Environment Control
Model MC-01

SET THERMOSTAT

HOLD THIS SWITCH to the RIGHT ◑ ——→ CENTER LED will come on. While turning the SET THERMOSTAT knob and watching the DISPLAY, set your desired heater turn-on temperature, then release the switch. This setting can not exceed your SET TEMPERATURE and is automatically kept 2 degrees F lower

DISPLAY HI / LO

PUSHING THIS SWITCH to the LEFT ←—— ◑ and releasing will make the DISPLAY go blank for approx. 2-3 sec. The DISPLAY will then read minimum recorded temperature - blank - then maximum recorded temperature - blank - then go to reading the present sensor temperature.

EXHIBIT X

(CONTINUED)

ALPHA ENVIRONMENT CONTROLLER

#1) MCOI: ENVIRONMENTAL CONTROLLER: This **ALPHA** controller comes in four models; each model having the digital readout of temperature and set temperature. The remote temperature sensor is capable of being mounted up to 2000 ft. away from the controller. With this feature all the controllers could be mounted in a central area (office), the manager could then at a glance read what the temperature is in the area the sensor is mounted, and at the same time making any adjustments that he deemed necessary. Each MASTER CONTROL has a minimum speed setting, thus allowing the fan speed to be set at a minimum. If the preference is to have the fans shut off completely on low temperature then the minimum speed selector must be at the "OFF" position. Built into all **ALPHA CONTROLS** is a pulse mode. With an adjustment of the selector it will allow the fans to stop when the temperature falls, and providing the temperature remains low, the fans will receive a pulse of full power once every 5 minutes. This allows the fans to speed up to full speed for seven seconds and then shut off, thus giving some ventilation and eliminates possible fan blade freeze up.

Included in each model is the capability of checking the low and high temperature that the area achieved overnight. The controller automatically records in it's memory the lowest and highest temperature achieved from the last time the reading was checked. Each MASTER CONTROL is capable of controlling ONE or TWO SLAVE UNITS. Each SLAVE UNIT is rated for a 12 AMP motor load. With ONE MASTER UNIT and TWO SLAVE UNITS the load capacity is 36 AMPS which can be connected to 120 or 240 volts.

#2) MCOI-T **ALPHA** CONTROLLER gives you the additional capacity of controlling a heating system in conjunction with the ventilation. The **ALPHA** CONTROLLER offers a fully adjustable heating thermostat which uses a SPECIAL TECHNIQUE TO MINIMIZE ENERGY WASTE. When the heat is switched "ON" by the **ALPHA** CONTROLLER the fans will shut off completely if the minimum speed setting is in the "OFF" position. If the minimum speed selector is in the "RUN" position, then the fans will remain at the minimum speed selected. When the controller shuts the heat "OFF" the fans will start and the speed will slowly increase until the correct ventilation is achieved. This will CUT YOUR HEATING COSTS SUBSTANTIALLY!

#3) MCOI-A: is a DC alarm which will be activated with AC power failure or plus / minus difference (15°) between temperature and set temperature.

#4) MCOI-TA: has both the heating and alarm capacity.

#5) SLOI: is the SLAVE CONTROL UNIT which gets it's commands from the MASTER **ALPHA** CONTROLLER. The speed of the fans connected through the SLAVE UNITS will be the same as the speed of the fans connected through the MASTER CONTROLLER.

T. TUTT SALES LTD.

Box 1150 · Three Hills, Alberta · Canada
TOM 2A0 · (403) 443-7774

TEACHING NOTE & PRACTITIONER GUIDE

SOTA ELECTRONICS CORPORATION

SOTA ELECTRONICS CORPORATION

Teaching Note and Practitioners Guide

Synopsis

This case describes the development of a small company's first proprietary new technological product -- a computerized controller designed to monitor and control the interior environmental conditions and systems in poultry and swine livestock barns. The company is young and of limited financial strength. Its speciality has been custom R & D and assembly of micro-electronic products {systems} for clients in the agricultural industry. It is new to the design, manufacture and marketing of a proprietary product {company's own brand}. To date {mid 1985} the firm has gathered some market data on possible markets for its new product and has explored some competitive offerings. It has also completed initial product design, prototype construction and in-house {bench} testing of prototype units. It has plans to conduct field trials to determine how well the barn controller performs in actual end-use situations, and is prepared to re-design the unit to overcome any problems encountered in the field testing stage. In anticipation of successful field testing and in preparation for product launch in early 1986, the company president and owner wants to get on with the task of preparing a marketing plan for his new product.

The case gives details on (1) company background experience, and financial situation (2) the development of the barn controller (3) product characteristics (4) background concerning the operation of confinement barns (5) market segments and the competitive situation (6) buyer behavior, and (7) alternative channels of distribution.

Teaching Objectives

This case is suitable for courses and seminars dealing with development of technological new products. It is particularly useful for exploration of the steps in the new product development process and for illustration of the need to balance the technological design/production activities with research on the market, buyer-behavior and competition. It also provides an opportunity to construct a preliminary marketing plan in the face of uncertainties regarding: the field test performance of the new product; the company's financial resources and marketing capability; the perceptions and behavior of end-users; and the marketing practices, strengths and likely reaction of competitors. The case also provides a basis for making generalizations about the tough situation facing technological firms which, typically, are weak on market knowledge and skills. Specific objectives include:

1. To illustrate the many decisions involved in getting a new technological product into the marketplace and the particular challenges faced by small companies (technological entrepreneurs) which lack market knowledge and marketing experience.

2. To explore the steps of the new product development process and the need to balance technical and marketing activities.

3. To investigate issues of: company strengths and weaknesses; market structure, size and growth rate; market segmentation; competition, buyer behavior; and technological change.

4. To identify the factors that are associated with new product success/failure.

Teaching Suggestions

1. A good way to start the class might be to ask for students' opinions on whether the product is a "go" or a "no-go", and their reasons. What will appeal to the buyers? Why should any distributor or dealer carry it? To clarify the discussion, ask students to describe SOTA's product line, particularly the benefit positioning of the new product.

2. This should lead into some discussion of market prospects for the barn controller: market size, segments, prospective sales, etc. Are these sizeable enough to make it worth SOTA'S continuing with the launch?

3. At this point some preliminary discussion of a potential marketing mix should be initiated, starting with opinions on the proposed price and promotion strategies. Do these fit with what we know of the market?

4. The discussion may then easily lead into the alternative channels of distribution, and who is responsible for which activities in each case. How do these mesh with SOTA'S abilities, and with what we know of the market?

5. Once some consensus has been reached on the channel, the marketing mix to be used should be finalized to enable the students to see the complex inter-relationship among these decisions. What effect does our chosen channel have on proposed price, promotional budget and focus, break-even and profit projections?

Specific Questions

1. What is SOTA's product?

2. How would you appraise SOTA'S NPD process -- good or bad? Has it maintained a timely balance between technical and market/marketing activities?

3. What are the market prospects for the barn controller? What unique, competitively superior benefits does it offer the buyer?

4. In each of the possible channels of distribution, who would be responsible for each task or function? What are the pros and cons of the various channels?

5. As Mr. Berezay, what marketing mix would you choose? What should the timing of the launch be?

6. Is it wise for SOTA to attempt to market the product itself? What options might be open to SOTA if it wanted to "hire a marketing arm"?

Analysis

1. What is SOTA's product?

Product line: SOTA appears to be interested in building a product line containing two major product categories: {a} custom R & D contracts to design and assemble electronic components or systems for clients who, typically, take the initiative to approach SOTA and {b} SOTA'S own brands of proprietary products which are both initiated and marketed by SOTA. In its first few years of operation, SOTA concentrated on custom work and no doubt plans to continue this activity to help provide a cash flow for investing in proprietary products.

It is important to point out that proprietary products place SOTA in a whole new ball game. In contrast to custom work, proprietary products require SOTA to: identify user needs or problems; estimate the likely size and nature of the market and competition; invest time and financial resources in product development and learning about and educating the market; and undertake marketing planning and execution. SOTA will not only have to be good at technical aspects of product development but it will also have to develop detailed knowledge of buyers, markets and competition and it will have to become proficient at implementing marketing strategies.

Product item: the barn controller. The barn controller can be described as a new product to SOTA and an upgraded or feature improved product to the market. It is not an entirely new product concept, since existing "controllers" handle some of the functions (i.e., provide some of the benefits) which SOTA'S unit will provide. The end-users are familiar with some degree of electro-mechanical assistance in operating barn environmental control systems. However, the present products (controllers) available on the market do not handle as many functions as does SOTA'S unit. A useful way to position SOTA'S product is as below:

{degree of benefits provided}

-----X--------------------X------------------------X-----------------

competitors		SOTA
narrow spectrum	medium spectrum	broad spectrum
(single function)	(several functions)	(full function)
controllers	controllers	controllers

Other useful ways to classify SOTA'S barn controller are in terms of the newness of the technology and the stage of the life cycle of the product category. Clearly, the controller involves use of existing technology rather than development of a new technology. The technological sophistication of users and systems in the confinement barn market is increasing but it does not appear that the rate of availability and adoption of more advanced technological equipment and systems is extremely high. While Mr. Berezay points to farmers becoming familiar with computers, there may yet be considerable resistance to adoption of computer based controls systems. In fact, the adoption literature would suggest that users will be slow to adopt new products or technologies which require them to undergo major changes in learning, attitudes and behavior. Since SOTA'S unit is reasonably broad spectrum (full-function) in its application and since it involves electronic/computer elements, it may be reasonable to conclude that a degree of farmer adoption resistance will be present.

Confinement barn farming is a mature industry. The supplies of both poultry and pigs are controlled by marketing boards, therefore, the market size [number of confinement barns] will likely grow or change only with increases in population or with major changes in price or consumer preferences for types of meat. The market for more advanced barn controllers may, however, be in a growth stage if farmers are inclined to replace or retrofit their present "yesterday's technology" controllers with "today's technology" controllers of the type that SOTA has conceived. To SOTA, its barn controller is in the pre-introductory or pre-launch stage of the product life cycle. When SOTA introduces its product to the growth (or mature) market it can anticipate that competition will exist from other lower technology or more limited function controllers. SOTA will therefore be faced with both the expense and challenge of competing for the buyers' preference. Indeed, SOTA will be in a different ball game from the custom market where the buyer takes the initiative and seeks out SOTA as a sole source.

SOTA's product can also be positioned on the stages of the new product development process presented in Figure 1. It is ready for prototype testing and development of a formal marketing plan. Figure 1 is discussed in more detail in the analysis of question #2 below.

2. How would you appraise Sota's NPD process - good or bad? Has SOTA maintained a timely balance between technical and market/marketing activities?

The first step should be to identify the stages that SOTA used to date and plans to use in the near future to develop its new product. To assist in this task the instructor should make use of one of the many models or flowcharts of the new product development process which are outlined in various marketing and new product texts. All of these models are normative, that is, they present an ideal view of how a firm should go about developing a new product. A normative model proposed by Dr. Robert Cooper, a respected authority on new product development, is outlined in Figure 1. The instructor should point out that the proposed stages or steps in the new product development process should not be viewed as a lock-step sequence; rather the process should be an iterative one with many overlapping feedback loops.

How well has SOTA performed in developing the new barn controller? Has it missed any steps? Has it under or over emphasized any specific activities. The instructor should get students to list SOTA's steps and activities using the framework in Figure 1 (or a similar model).

FIGURE 1

A NORMATIVE MODEL OF THE NEW PRODUCT DEVELOPMENT PROCESS

STAGE	TECHNICAL/PRODUCTION ACTIVITIES	MARKET ANALYSIS/ MARKETING RESEARCH ACTIVITIES
IDEA GENERATION:	.Technology "push".	.Market "pull".
SCREENING:	.Fit c tech./production skills, resources.	.Fit c marketing competences. .Market attractiveness.
PRELIMINARY ASSESSMENT:	.Initial technical appraisal.	.Quick market study.
CONCEPT:	.Technical concept development {sketches, models, description}.	.Concept identification market study. .Concept test among key potential buyers.
	{Preliminary business analysis}	
DEVELOPMENT:	.Design and prototype development.	.Development of formal marketing plan. {more buyer behavior research}
TESTING:	.Prototype tests in-house. ."Finalize" product design.	.Prototype tests with users. ."Finalize" marketing plan.
TRIAL:	.Pilot production. .Modify design, process.	.Test Market. .Modify marketing mix.
	{Pre-commercial business analysis}	
LAUNCH:	.Full scale production. .Measure, modify.	.Execute marketing plan. .Measure, modify.

This exercise should highlight, among other things, the following:

Good Points:

- -used interaction on consulting work to generate ideas.
- -concept tested with some prospective customers and government agriculture experts.
- -after designing and building prototype, plans to test in the field, followed by corrections and retesting -- this should minimize problems.
- -plans to conduct market research slightly ahead of technical process, ensuring that product is worth continuing to develop.
- -checked out size and growth rate of market segments, as well as some thought to buyer and channel behavior, and competition.
- -attempted to ensure that product development and market launch is adequately funded.
- -Etc., students may identify other strong points.

Weak Spots:

- -no detailed study of market needs, buyer behavior and competitors marketing approaches. Over-emphasis on technical aspects of concept; need more buyer inputs.
- -perhaps, too little attention to the possibility that SOTA may not be proficient at executing all the marketing tasks necessary for successful product launch.
- -no apparent attempt to perform financial viability analysis for the new product venture at various stages of its development.
- -overly optimistic about the time required for and likely success of product performance tests in actual field applications {see Postscript at end of this instructor's guide}.
- -no evidence of plans to conduct a test market.
- -appears weak in both financial and human resources for executing and managing product launch.
- -Etc., students may identify other weaknesses in SOTA's approach to new product development.

Upon the completion of this critique of SOTA's approach to new product development the instructor should comment on the general situation facing small, technology/engineering oriented firms who become enthusiastic about the prospects of having their own brands {proprietary products}: the weak spots are usually related to market knowledge and marketing skills; there is a tendency to over-emphasize the technical/production activities.

The instructor should also ask for student opinions on whether and how far SOTA should proceed with this product. Some students might suggest dropping the whole idea now or after unfavorable field tests. Others might suggest approaching a competitor, such as the Chore-Time marketer, and trying to sell the design and/or product to them. The latter option would provide SOTA with a much needed "marketing arm". (There is more discussion of the latter option under question #6 below).

3. What are the market prospects for the barn controller? What unique, competitively superior benefits does it offer the buyer?

a) Market Size:- Swine

Manitoba	3,271 farms
Canada	60,000 farms - assume 1/2 of total too small to be interested in the product, therefore, 30,000 farms.

Poultry

Manitoba	583 producers
Canada	6,000 producers

b) Contribution Margin (CM) and Break Even

dealer price	$6,000
direct costs	$2,000
CM	$4,000/unit

Fixed Costs	$85,000
Marketing Person	$20,000
Promotional costs	$30,000
	$135,000

$135,000/$4,000 = 34 units to break even

c) Market Shares:- assume Poultry Market, only, to start

To Break Even: 34/583 = 6% of Manitoba Market

34/6,000 = 0.6% of Canadian Market

d) Profits:

If a 5% market share is achieved:
Manitoba 5%=29 units
(29x$4,000)-$135,000=($19,000)
Canada 5%=300 units`
(300x$4,000)-$135,000=$1,065,000

If a 10% market share is achieved:
Manitoba 10%=58 units
(58x$4,000)-$135,000=$97,000
Canada 10%=600 units
(600x$4,000)-$135,000=$2,265,000

e) Qualitative Aspects:

Some aspects of SOTA's situation suggest the product may be a success:

- well developed product, provides distinct benefits to user
- B/E point for Canadian market relatively low
- very little direct competition
- some understanding of market -- it should be possible to reach buyers effectively

However, other factors suggest that there may be some barriers to success:

- very expensive product, and agriculture economy is depressed
- a rollout strategy requires rapid success in Manitoba as local B/E is a bit high
- buyers will need very strong confidence that it will work and will provide the expected benefits, and may not rapidly accept a very new, very expensive product
- SOTA does not have marketing expertise

A key to determining the likely success/failure of the barn controller is to ask the question: Does it offer unique and superior benefits (or value-in-use) to the farmer? Students should be presssed to defend their opinions. One format that will facilitate this discussion is to arrange the features of each system as follows:

	Present Electro-Mechanical (on-off) Systems	SOTA's Micro-Processor Based Controller
Technology:	--- etc.	--- etc.
Functions or Components Controlled:	--- etc.	--- etc.
Operator Involvement:	--- etc.	--- etc.
Precision:	--- etc.	--- etc.
Price (installed):	$4000	$8000
Operating Risks/Problems:	--- etc.	--- etc.
Etc.:	--- etc.	--- etc.

Once the features of each system are listed the instructor must ask for each feature: "What benefit (or value-in-use) does the farmer gain from this feature?" Students should be "pushed" to think of benefits derived from features, not just features per se. The benefit or value derived from a particular feature or characteristic of a system (product) may be positive, neutral or negative. For example: the "more precise environment control" feature of the SOTA system is a benefit to farmers because it may result in energy/operating cost savings (a financial benefit), increased efficiency in production via better weight gain per unit of food intake (a financial benefit, in the end), etc. The data logging feature may be a neutral or so/so benefit, that is, farmers may not care whether this feature is present or absent. The feature of an all-systems-in-one or full function controller may produce a negative benefit or a negative value-in-use. Farmers may feel that use of SOTA's system would raise the risk to livestock since all the barns environment components/functions are managed by one "black box". What if the "black box" malfunctions? Will all the livestock be at risk? Will farmers see SOTA's product as a risky "ideal" system? If they do, their "operator stress" may be increased not reduced.

The point to emphasize is that SOTA, in fact, does not know in detail what the farmer (key decision makers) decision making behavior and benefit perceptions will be. It has not conducted a detailed buyer behavior study and it has no detailed knowledge of the benefits stressed by competitive firms. In sum, it is dangerous for SOTA to assume that the features it has designed into its barn controller will indeed be viewed positively and as offering competitively superior benefits. Perhaps SOTA has built a Cadillac {ideal/full-function} system when the market need is more suited to a narrower or limited function Buick or Oldsmobile.

NOTE: Some of the limited function competitive products (eg. Chore-Time) may be Buicks or Oldsmobiles!

4. In each of the possible channels of distribution, who would be responsible for each task or function?

   a) Electrical Contractors:

      -SOTA would be responsible for all aspects of production, shipping and promotion, as well as training and backing the contractors. Contractors would be responsible for ordering, installing, and servicing the equipment, but would not likely do much promotion or selling, as they do not operate that way and are not an information source for the farmer

      -SOTA would keep very close control over all aspects of the marketing

      -to visit approximately 300 contractors on a regular basis (assume once every two months) SOTA would need a company sales force:

      (i) 300 contractors x 6 times/year=1800 visits

      (ii) A salesperson could not likely visit more than 6-8 outlets per week, allowing for travel time. Assume 8 visits/week

(iii) At 8 visits/week, one sales person can make 8x50=400 visits/year
1800/400=4.5 or 5 sales people

(iv) Assume $20,000 salary plus another $20,000 for expenses each = $40,000 per person
5x$40,000=$200,000 in additional expenses

b) Electrical Distributors:

- the distributors would perform some promotional activities, as well as holding inventory. They would probably not promote this product specifically or heavily to contractors, thus SOTA would still be responsible for extra promotion, specifically to farmers to create pull
- SOTA would be able to increase production runs to produce for distributors inventory, rather than bearing inventory costs themselves
- no extra staff would be needed as the one marketing person could deal with 12 distributors outlets
- assuming that SOTA worked to maintain the $6,000 price to the electrical contractor, they would have to allow the distributors margin out of the firm's existing contribution margin. At 25% this would cut SOTA'S C.M. from $4,000 to $2,500 per unit

c) Agricultural Equipment Distributors and Dealers/Feed Mills:

- the distributors and dealers would provide most marketing and promotional functions -- SOTA would need only to do some background advertising, particularly for the launch. Sales people for the dealer or feed mill were a recognized information source and would approach farmers
- distributors would hold some inventory and SOTA could increase production runs, as above
- the one marketing person to be hired could probably handle dealings with approximately 20 distributors and feed mills
- the contribution margin would again be reduced, if a final price of $6,000 uninstalled was desired

final price..... $6,000
dealer's markup
of 10%.......... -545
price to dealer..$5,455
less distributor
markup of 30%....-1,259
price to
distributor......$4,196

This reduces SOTA'S C.M. to $2196 per unit.

5. As Mr. Berezay, what marketing mix would you choose?

Price and promotional budget seems okay as given in the case and fit well with market information. Because of superior contacts and experience in the business, the agricultural equipment dealers [discussed in 4(c)] are probably the best channel to choose.
The reduction in profit margin changes the B/E point as follows:

$135,000/2196 = 62 units

62/583 = 11% of Manitoba market; 62/6000 = 1% of Canadian market

If the financial picture can support a rapid rollout, the Canadian prospects are good.

6. Is it wise for SOTA to attempt to market the product itself? What options might be open to SOTA if it wanted to "hire a marketing arm"?

SOTA lacks experience and proficiency at marketing products (in contrast to selling consulting service). SOTA is not familiar with arranging and managing channel members; it has little knowledge of promotion to end-users; and it has not experienced pricing dynamics in the product markets. Perhaps SOTA would be well advised to collect detailed information on the organization and marketing practices of competitors, such as Chore-Time. Perhaps SOTA's single product would fit in well with the broader product line of the Chore-Time organization. Perhaps SOTA should define itself as a custom R & D company not as an R & D and marketing company. Marketing a proprietory product requires information and skill which SOTA is lacking and in which they may not be willing to invest.

7. POSTSCRIPT

In November 1985 Mr. Berezay attended a Business School's industrial marketing class at which the SOTA case was the subject of discussion. After listening to students' analysis and recommendations, Mr. Berezay offered several comments.

He explained that the launch of the controller was behind schedule due to several factors: the engineer who had babysat the controller was assigned to a custom project in Alberta on which SOTA hoped to make a good profit; a new engineer was handed the controller project but was still not entirely familiar with it. Mr. Berezay was actively seeking new custom R & D projects. In fact, in the hour before he came to the class he had taken on a $10,000 R & D contract for a client. The controller had not yet undergone actual long-term field {"in use"} testing, but this was planned for one week hence. A large confinement barn belonging to a prominent poultry industry association official was to be "wired" with SOTA's system for a three month period. Performance data were to be collected.

Update {April 1986}: On a visit to SOTA's new offices {the firm's period of government subsidized advance-factory space had expired} the professor of the industrial marketing class obtained the following update: Mr. Berezay felt that the product had worked in the field test; the farmer was happy. But Mr. Berezay had fears about the reliability of his barn controller system; "The software was cumbersome {27K}; we were trying to control too many things -- we modified the system to include only the monitoring, alarm and communication functions -- we eliminated the risky control function -- trying to control requires very elaborate and 100% reliable software and components -- we have now produced five more of the simplified systems, but have not pursued opportunities to market them -- we have been very busy with the new business and with moving to new offices."

GENERAL PRINCIPLES {MESSAGES} TO BE LEARNED BY SMALL, TECHNOLOGICAL NEW PRODUCT FIRMS

Based on the situation presented in this case and on the issues raised in the analysis, the following generalizations can be drawn:

1. THE "FIT" BETWEEN THE COMPANY AND THE NEW PRODUCT OPPORTUNITY MUST BE CAREFULLY ASSESSED.

SOTA's strengths are in custom R & D. It lacks the finances, market knowledge, marketing skills and, perhaps, committtment necessary to successfully pursue the option of becoming a proprietary product marketer. There is a big difference between being a custom R & D firm and being a speculative R & D and marketing firm! Small, technological, new product firms are often faced with prospects for developing beyond the custom business. This step should not be taken without sufficient finances, marketing skills and committment to stick with it. Based on the POSTSCRIPTS, SOTA seems to be losing its enthusiasm for developing a proprietary new product. Perhaps it should have come to the realization of the poor "fit" much earlier in the development of the barn controller. Perhaps it could still sell the idea and technological development progress to an established marketing firm such as the Chore-Time organization.

2. STEPS IN THE NEW PRODUCT DEVELOPMENT PROCESS MUST NOT BE SKIPPED.

Had SOTA carefully followed each of the steps outlined in Figure 1, it may have kept the barn controller project at a manageable risk level. In particular it may have addressed the crucial issues about buyer behavior and competitive product positioning that were outlined in the analysis of this case. Also, SOTA should have been aware of the financial attractiveness of the project at various stages of development, but it did not perform the type of financial analysis which was outlined in the case analysis. Furthermore, SOTA appears to be ignoring the test market or TRIAL stage of new product development. Even if field tests on the revised versions of the controller are positive, SOTA would be well advised to plan to conduct a trial marketing launch in a well defined segment such as large poultry farmers within a 50 mile radius of Winnipeg. This trial would provide valuable information for planning a broader launch of the product. If steps in the new product development process are skipped, the chances of product failure are significantly increased.

3. A BALANCE MUST BE MAINTAINED BETWEEN TECHNICAL/PRODUCTION ASPECTS OF DEVELOPING NEW PRODUCTS AND THE MARKETING RESEARCH/ANALYSIS ASPECTS.

Many technically oriented firms fall "in love" with their product, pay detailed attention to the technical/production activities, and pay little or no attention to the market analysis and marketing research activities. In terms of Figure 1, these firms tend to emphasize the technical/production column of activities and ignore or do a poor job of the marketing activity column. SOTA, actually, is stronger in marketing orientation than many other such firms: it did collect and analyze market figures and it did perform concept and product tests with knowledgeably individuals and end-users. Also it is attempting to develop a marketing plan in anticipation of satisfactory field testing of the product. It can be congratulated for this attention to marketing issues. However, SOTA can be criticized for inadequate understanding of buyer behavior and competitive firms and their marketing practices. The risk of product failure is lessened with a balanced approach to new product development.

4. MARKETS AND COMPETITION MUST BE ANALYZED.

Any new product must receive sufficient demand to make the venture profitable. The extent of demand depends on the size and growth rate of the total market and on the ability of the new product to compete with competitors' offerings. Firms which become overly impressed with their new product without objectively analyzing the nature of the market and competition, often end up in the graveyard of product/company failures. SOTA has done a commendable job of sizing up the market but it lacks understanding of competitor marketing practices and strengths.

5. BUYER BEHAVIOR MUST BE UNDERSTOOD.

SOTA did test its concept and prototype product with a few knowledgeable individuals and a few end-users. However, it has not thoroughly analyzed the benefits and risks an end-user would see in SOTA's product compared to the offerings of competitors. As the case analysis outlines, there are some serious questions about the farmers' views on the value of a broad spectrum (controls many functions) product like SOTA's barn controller. A detailed study of buyer behavior when the product was in the concept or "sketch" stage may have produced the same information that SOTA's eventual field tests produced (that is, a more limited function unit might meet with more market acceptance). Had SOTA done this early buyer behavior research, it would have saved a year or more of time and considerable money and it would likely have ended up with a product version that could be marketed with success. Firms should view market research into buyer behavior as an investment rather than as an expense. It is dangerous to assume that buyers will see the product in the same favorable light that the inventors do.

6. FINANCIAL FEASIBILITY ANALYSIS MUST BE PERFORMED.

Periodically, throughout the product development process, firms should calculate the financial attractiveness of their new venture using the best available estimates of demand, price and costs. There is no evidence that SOTA performed the detailed financial analysis which was presented in the analysis of this case. The analysis should highlight the unit sales and market share required to break-even and to provide an acceptable return on investment. Armed with these estimates, the manager can make a reasoned judgement about the likelihood of his or her firm achieving this level of performance in the competitive marketplace.

7. CHANGES IN THE TECHNOLOGICAL AND MARKETING ENVIRONMENT MUST BE ANTICIPATED AND ANALYZED.

SOTA's opportunity has resulted from matching technological possibilities with market needs. The president can be complimented for his creative spotting of this opportunity. However, should SOTA enter this market, it will have to be prepared to keep up with technological advancements in competitors' barn controller systems. In rapidly moving technological areas, it is easy for a firm to lose its innovative advantage. Another feature of changing technology is product obsolescence. Small, financially weak firms must ensure that their product/market segment need will last long enough to provide them with a return on their sunk investment costs. Small firms cannot ensure this by exerting market power or control (as can large firms) but have to attempt to ensure it by careful analysis of the market opportunity and by careful monitoring of changes in the market and technology.

8. MARKETING TASKS AND PLANS MUST BE PERFORMED BY SOMEONE AND THEY MUST BE EFFECTIVELY CARRIED OUT.

SOTA wishes to become a proprietary product marketer. But, it has underestimated the number and importance of the marketing tasks that must be carried out to make its dream a success. This is characteristic of many small, technologically oriented firms. SOTA does not have the marketing know-how to make a quick success of their product. It must either invest in developing marketing competence or hire a "marketing arm" by approaching a distributor or, indeed, a competitive manufacturer. Somebody must skillfully execute promotion, distribution and pricing strategies in the competitive product/market environment. Often the small, technical, inventive firm is well served by teaming up with another organization which has marketing experience in the relevant product/market area; "going it alone" is appealing but often unrealistic.

9. SUCCESSFUL NEW PRODUCT DEVELOPMENT AND MARKETING REQUIRES COMMITTMENT OF CONSIDERABLE TIME, SKILL, AND RESOURCES.

SOTA's new product appears to be taking years not months to bring to the market. Also, it appears to require enduring committment that the president and staff are not prepared to give. Has the halo of a proprietary product burst?

New product developers mustrealize that there are few overnight successes. They must marshall the finances, skills and energy to "babysit" the new venture until it achieves success. SOTA appears to be weakening!

10. OTHER POINTS:

(a) Whether applying new or existing technology to solve users needs, firms must adopt a marketing orientation rather than a strictly technological, engineering or production orientation. In the end the customer is king!

(b) Small, financially weak firms can spread the risk of new ventures by seeking financial assistance from governments and venture capitalists or by obtaining contracts for joint-funding or minimum purchase requirements from key users.

(c) All firms, regardless of size, must constantly address the questions: What business are we in? What business do we want to be in? What business do we have the competence to be in? What resources and competences must we acquire to move successfully to a new product or market area?

Section 3

CASE STUDY:

WINTEC ELECTRONICS (A)

WINTEC ELECTRONICS (A)[1]

In early 1985, Mr. Frank Williams faced a major decision: what was the next step to take in launching the new electronic spray meter control panel for agricultural crop sprayers developed by his company, Wintec Electronics Inc.? Mr. Williams founded Wintec, his own electronics design and manufacturing firm, in Winnipeg, Manitoba, in 1978. The sprayer meter control panel was Wintec's newest component part product. It was developed under an agreement with Can-Spray, a small agricultural marketing company. Can-Spray was supposed to buy Wintec's control panel, assemble it with other components to form a "new system" for controlling chemical mixing and flows on agricultural crop spraying equipment, and sell the new system (called Ag-Chemical Injector) to sprayer manufacturers, distributors and/or users. However, Can-Spray had run into financial problems and significant sales had not materialized. Wintec was faced with a frustrating situation. Mr. Williams explained: "I believe that this product has some good possibilities, but I'm not sure what the next step should be. Should I scrap the control panel and move on to something new, or should I try to buy all the rights and market it myself? Marketing is not my area of expertise, but I don't want to waste all those months of R & D if the product is a potential winner."

Mr. Frank Williams - Entrepreneur

Mr. Williams was a professional engineer with many years experience in electronics design. After his graduation in 1964 he had worked for 14 years in a variety of different design jobs. His experience also included marketing positions with two distributorships, and teaching electronics at Red River Community College for two years.

In 1978 he started Wintec Electronics in the basement of his home. For the first two years he sold his expertise in design and manufacturing of electronic parts, even though he had no manufacturing space. He sought contracts from manufacturers he had dealt with in the past, offering to design and build a new or improved control or part for an existing product. He sold

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[1] This case was prepared by Morva Bowman, M.B.A. under the supervision of Dr. Dennis Anderson, as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Support for the development of this case was provided by the Technology Division, Manitoba Industry, Trade and Technology; Management Excellence in Small Business Program, Department of Industry Trade and Commerce, Ottawa, and Canadian Studies Program, Secretary of State, Ottawa.

the "product", even though he had not yet produced it. He would meet with the prospective customer to determine how their needs and his abilities could fit together, and then return with a product proposal. His first customer was Versatile Farm Equipment Company, an established Winnipeg based manufacturer of tractors and related farm implements, for whom he designed and built a new electronic turn-signal flasher to be used in various models of tractors. This initial project was successful, and the first run was followed by a larger production order. At the same time he successfully negotiated a contract with Controlled Environments Ltd. to design a prototype environmental control chamber for scientific research.

With these orders in hand, Mr. Williams was able to negotiate a lease on Advance Factory Space through the Winnipeg Industrial Technology centre, a project of the Manitoba government Department of Trade and Commerce. This program allows new manufacturers access to factory space with initial rent reductions, enabling their business to grow without the heavy burden that renting large amounts of space would bring. For the first six months, the company pays no rent; for the next six months the rate is one third the normal charge. From 12-18 months they pay two thirds, and after 18 months, the full rate. At the end of two years the business is expected to have grown enough to move out into regular factory space on its own, with no subsidies.

Wintec was very successful and in 1982 moved into new premises as an independent design and manufacturing firm. By 1985 the firm's annual sales volume was $2.0 million, and it employed a staff of twenty-six persons. [See Exhibit I for organizational structure]. The company produced 40 different products, covering three different market areas and serving five corporate customers.

About 30% of Wintec's work was in electronics for agricultural equipment, including dashboard control panels, sensing devices, and instrumentation electronics. Most of this production - over 80% - was for one agricultural equipment manufacturer, Versatile. Over the past three years the agricultural industry had not been strong and although this had been a growth area for Wintec, most of the increase has come from increased use of electronics in different types of agricultural equipment, rather than increased sales of any particular type of machinery.

The remainder of Wintec's sales were divided into about 30% industrial/scientific research equipment, another 30% a controller for satellite dishes, and about 10% miscellaneous small jobs. [See Exhibit II]. Although sales were good, they were also somewhat cyclical - most agricultural equipment components are produced during the fall and winter, to be ready for spring selling. The satellite dish controller was also manufactured largely in the fall, to be sold as a gift item at Christmas. Production of scientific research equipment was steady, but this left excess production capacity available during the spring and summer months.

Mr. Williams was responsible for all marketing activities, and for initiating all new product development. The development process was not formalized, but occurred in response to requests from existing customers, as a result of sales pitches Mr. Williams had made to potential buyers of Wintec's capabilities, or as a result of an individual or firm asking Wintec to do the technical development on a product idea for which the asker felt there was a market opportunity; the askers were usually prepared to do all the marketing. Products were only developed when the firm had an assured customer, preferably one who made some financial commitment to the R & D process up front. There was no specific screening process -- Mr. Williams decided to go or not based on his experience and personal assessment of the customers. "To compete with government funded R & D facilities and to generate work for my production facility, R & D projects are priced at cost -- Wintec's profit lies in manufacturing the finished product," he explained. [See Exhibit III].

"I'm not very aggressive in my marketing efforts," explained Mr. Williams, "I say 'no' to a lot of projects if I don't like the sound of them, and we don't follow any formal strategic planning or market segmentation outlines. It's all in my head, so far. In another year or so, if the company continues to grow like this, we'll have to hire a full-time marketing manager. I don't really have the time to give marketing the attention it deserves."

Mr. Williams identified several problem areas for the firm. "We need more customers in each of our three market areas - right now we are vulnerable to a slow-down from one of our main customers - it could cut back almost one-third of our production. In addition, like most businesses in a growth stage, we are limited by production capacity in some areas, and by cash flow. In order to compete effectively outside Winnipeg -- in Canada and the U.S. -- we would have to increase production efficiencies, and improve both cost and quality control."

"My goals may not be part of a formal plan, but we have them." continued Mr. Williams. "Just to keep up to the market and our competitors, we need to increase our volume by 30% per year, and I would prefer to make that 50%. We need to expand our product line and our marketing activities. In this business, growth is vital to keep up with the industry, and to keep good technical staff interested."

Development of the Ag-Chemical Injector System

The concept for a new system to handle crop sprayer chemical mixing and flow rates was originated by Can-Spray's entrepreneurial owner. The Ag-Chemical Injector was a system to control the injection of two different chemicals in agricultural sprayers. It was positioned as an "add-on" to crop sprayers produced by other manufacturers. It permitted sprayer operators to set the injection rate, thus determining the strength of the chemical mixture. It also allowed them to turn one or the other chemical on or off 'on the fly' during spraying, or to switch to just one side of the sprayer. The operator could thus do spot applications of a particular chemical where needed and, in addition, could spray half-widths along the edges of fields. The injector included a tank for concentrated chemicals, an electronic control panel, flow meters, pumps, valves and piping, and could be readily installed on most sprayers. (See Exhibit IV for product brochure). Wintec Electronics had developed and could manufacture a new control panel for the Ag-Chemical Injector. It was developed under contract with Can-Spray, the marketing company which assembled and distributed the Injector. The control panel incurred R & D costs of $30,000, half of which was supplied by Can-Spray, the rest by Wintec. Mr. Williams hoped to make back the investment and a profit on manufacturing the panel for Can-Spray. The panels would be sold for $425 each, and direct manufacturing costs were about $300 per unit. Production set up costs would total $75,000.

As Exhibit IV indicates, the present Ag-Chemical Injector is designed so that choice of one or two chemicals is controlled by a remote switch mounted on the tractor. This lessens operator effort and time, since there is no need to stop the tractor and walk to the back of the sprayer tank every time spot applications or chemical choice is desired. However, the flow rate of the chemicals or "chemical calibration" must be performed manually by hand adjusting flowmeters on the Ag-Chemical Injector assembly itself. Chemical flow rates are, therefore, not subject to remote (from-the-tractor) control. Mr. Williams stated that a significant ($30,000-$40,000) additional R & D investment would be required to design a system that included remote control over both functions: choice of chemical types and selection of chemical flow rates (chemical calibration). He had no intentions, at present, to begin work on the next generation of the Ag-Chemical Injector system. He felt the present design would meet with market success even though the chemical calibration or flow rate control function was not "remote".

Mr. Williams had decided to take on the project because he felt the product offered a number of distinct advantages to the farmer. As the chemicals were mixed as needed, rather than tank mixed, there was no wastage of chemicals, and no dumping problems. Spot applications of a particular chemical were easy with this system. In addition, some chemicals could not readily be tank mixed due to problems of chemical precipitation, and this equipment avoided such difficulties. It was easy to install and could be sold as an add-on to any sprayer.

The product looked good, but Can-Spray was not placing large manufacturing orders for the control panel. Because of financial difficulties Can-Spray proposed to back the whole project up by at least one year. Mr. Williams was concerned that the delay would provide the opportunity for the competition to be "hot on our heels". Mr. Williams was concerned about how Wintec could recoup the investment it had made in R & D on the Ag-Chemical Injector. The firm did not own the rights to the panel, but if Can-Spray were no longer interested perhaps Wintec could purchase the panel. If so, how could Wintec assemble the other system components and market the product?

The Agricultural Sprayer Market

The Manitoba Department of Agriculture estimated that of the 20,000 farmers in Manitoba, about one-half owned sprayers. Manitoba had about 20% of the prairie provinces total in land area and equipment investment. Most sprayers ran for 10-15 years, so less than 1000 new sprayers were sold each year in Manitoba. Chemical spraying of herbicides represented a significant investment to the farmer, who spent on average $10,000-12,000 per year on herbicides. For information on new spray chemicals, systems, procedures and equipment, the farmer looked to his equipment dealer, agricultural chemical supplier and frequently to the government representatives. The Department of Agriculture answered phone queries and sent out regular mailings on new product test results to farm operators across the province. The spray chemical manufacturers and certain specialty dealers who handled chemicals, sprayer parts and sprayers were more informed sources than sprayer manufacturers or broad product line distributors and dealers. Usually, the farmer who walked into a broad product line farm equipment dealer or distributor would buy a general purpose sprayer and some common add-on or replacement parts like pumps and nozzles. However, he was unlikely to receive special purpose parts or expert information.

There were about 15 sprayer manufacturers in Canada, the majority located in Saskatchewan or Alberta. Three were headquartered in Manitoba. (See Exhibits V and VI for sample product information). Most of these businesses sold their sprayers through agricultural equipment distributors, who offered both complete units and frequently replaced component parts. There were about 200 distributors throughout the prairie provinces, so they were highly competitive. In addition to company sales forces calling on dealers, some distributors utilized direct mail to approximately 110,000 interested farmers in western Canada, as well as advertising in farm papers and promotion at major trade shows. The spray chemical companies were very large and aggressive marketers who employed heavy regional promotion including massive T.V. advertising.

The sprayer equipment distributors sold to agricultural equipment dealers, who then resold to the farmer. There were about 350 independent dealers in Manitoba. Most were broadline dealers who handled large general purpose sprayers and commonly needed replacement parts. Sprayer prices to the end user ranged from $5,000 to $10,000 (for general purpose sprayers), with both distributors and dealers taking margins of 15-20%. Some local specialty dealers handled spray chemicals, special purpose sprayer packages or add-on systems. These dealers were very knowledgeable about spray chemistry and technology.

Can-Spray priced the chemical injector at $1,700 retail as a retrofit installation. Industry dealers and distributors considered this a reasonable price for the equipment, but had some concerns over its reliability. It had been marketed for the past two seasons in two earlier formats, but it was believed that field testing had been inadequate. As a result, there had been a number of problems with misapplications and product breakdown. Farmers were reluctant to try again. Said one equipment distributor, "The biggest problem with this type of equipment is to convince the buyer that it will work, that it is reliable. The herbicides used are very concentrated, and one mistake can have serious long term effects. It has to be very clearly fool proof -- from both machine and operator error. This makes it an up-hill marketing job. In addition, the supplier wants the distributors and dealers to be responsible for all aspects of the promotion, and frankly, I don't believe our Canadian market is big enough to make it a cost effective proposition for a distributor or dealer. The margins on equipment usually don't allow us to engage in expensive education, promotion and 'handholding' service to the farmer."

Several U.S. manufacturers were developing similar equipment, but distributors cautioned that the sprayer market was full of local idiosyncrasies. Sprayers were one of the pieces of farm equipment that differed drastically between Canada and the U.S. Canadian farmers used a 'wet-boom' sprayer (See Exhibit V for example) where the water and chemical ran through the metal pipes forming the boom (the wide part that actually did the spraying) to the nozzles. Canadian equipment was heavy, with double axles, large tanks, and longer (80 to 100 foot) booms. By contrast, U.S. farmers used smaller, fast moving suspended 'dry' boom sprayers, where the liquid ran through plastic hosing attached to a lighter, shorter boom, generally 40 to 60 feet in length. (See Exhibit VII). While equipment developed for Canada could be adapted for the U.S., it would require significant design changes to be saleable.

The Environment

One factor which made the injector a viable product was the growing interest and concern among farmers, government, and the public over agricultural chemicals. Although no specific government regulation of spraying existed at this point, it remained a possibility for the future. Provincial agriculture departments had been encouraging the development of chemical injection sprayers, as opposed to tank-mixed chemicals, for over 15 years. Such systems, when accurately metered, prevented over or under dosing of crops, both very expensive errors. Overdosing resulted in crop damage, while underdosing required additional investments of money and time to respray the fields. Chemical injections sprayers also saved the farmer money by reducing wastage -- unused chemicals could be saved and used later, as they had not been mixed with water. Finally, because the chemical is not mixed in the tank the farmer no longer has to dispose of an unused portion of a tank by dumping the herbicide in a ditch. The latter "dumping" occurence was quite common and represented both a financial loss to the farmer and an environmental pollution problem.

Conclusion

Mr. Williams reviewed his options to determine the best course for Wintec. He could try to push Can-Spray into going ahead with marketing of the Ag-Chemical Injector system product and thus purchasing his component, but he was not optimistic. The development contract did not include any requirement for Can-Spray to purchase a specific quantity of control panels.

If Can-Spray was no longer interested in the product, Mr. Williams might be able to buy their interest in the panel for $15,000 - $20,000. However, Can-Spray would still hold the patent on the non-panel components of the Ag-Chemical Injector system, so Wintec would have to design a somewhat different system around their control panel, or find another agricultural equipment manufacturer to do so. Mr. Williams wondered how this could be done, and whether it would be worth the effort.

A final option, of course, was to write off the $15,000 investment to date, and forget the product. This possibility had Mr. Williams wondering whether he should make some changes in the way he screened new product ideas and contracted development. How could he improve this process to prevent costly mistakes in the future?

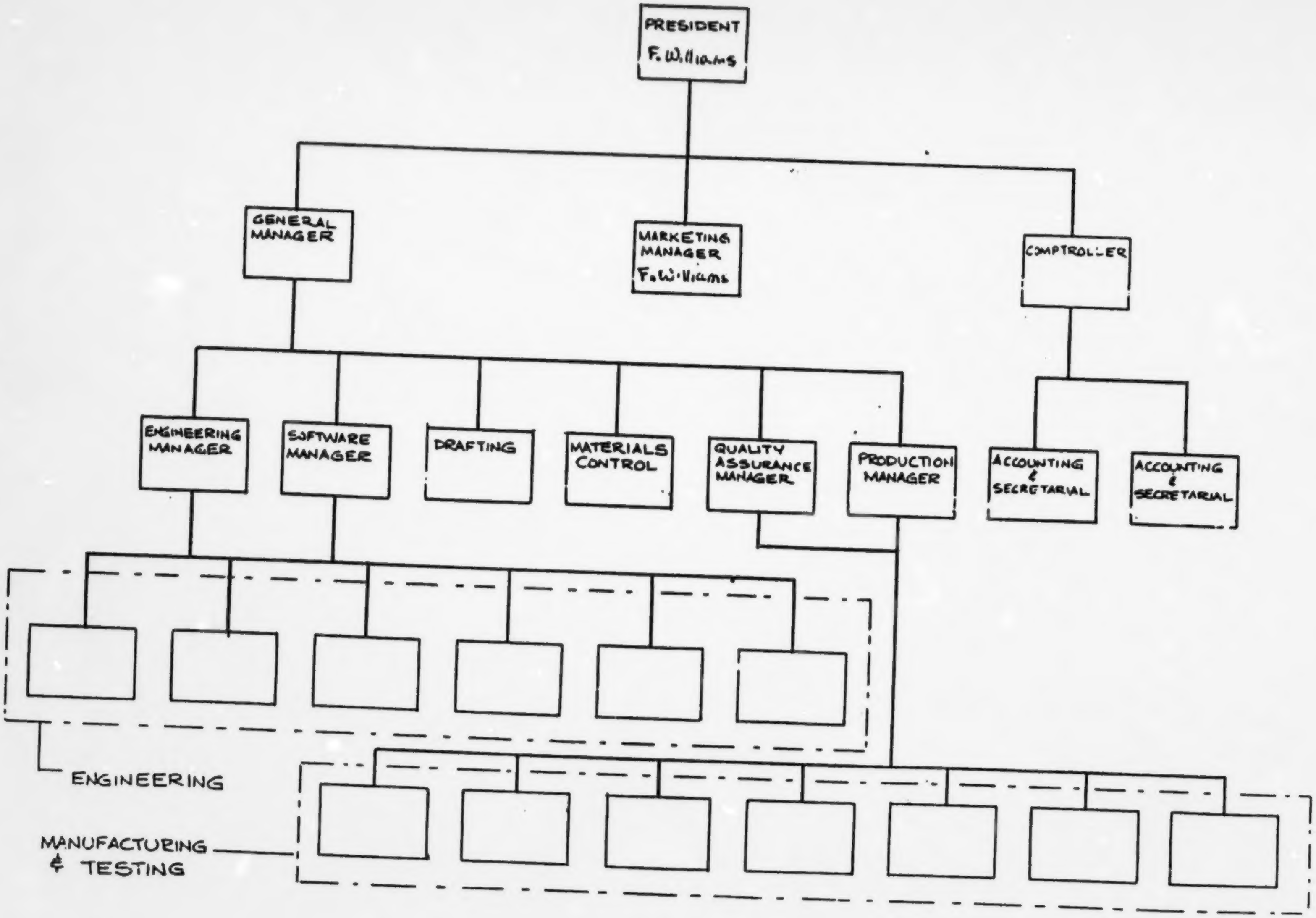
EXHIBITS:

WINTEC ELECTRONICS (A)

Wintec Electronics (A)

Exhibit I

ORGANIZATIONAL CHART


PRESIDENT
F. Williams
GENERAL MANAGER
MARKETING MANAGER
F. Williams
COMPTROLLER
ENGINEERING MANAGER
SOFTWARE MANAGER
DRAFTING
MATERIALS CONTROL
QUALITY ASSURANCE MANAGER
PRODUCTION MANAGER
ACCOUNTING & SECRETARIAL
ACCOUNTING & SECRETARIAL
ENGINEERING
MANUFACTURING & TESTING

Wintec Electronics (A)
Exhibit II

Product/Market Breakdown

MARKET AREA	CLIENT	PRODUCTS MANUFACTURED	APPROXIMATE SALES VOLUME
Agricultural	Versatile Manufacturing (agriculture OEM)	turn signal flashers depth controls transmission controls warning lamp panels for dash instrumentation monitor systems for grain swathers	$410,000
	Can-Spray	control panel for Ag-Chemical Injector	0
	several small contracts for minor jobs - other agriculture OEM's		$190,000
Industrial/ Scientific	Controlled Environments Ltd.	environment control chamber for research	$580,000
	Micro-Tool & Machine	computerized machine controls	$150,000
Satellite Dishes	Sat-Scan (satellite equipment manufacturer)	3 models of a dish controller	$600,000

Wintec Electronics (A)
Exhibit III

Selected Financial Data

Current Assets	$917,000
Accounts Receivable	360,000
Fixed Assets	149,000
Current Liabilities	700,000
Bank Indebtedness	282,000
Accounts Payable	309,000
Long Term Debt	20,000
Shareholder's Equity	338,000
Sales	2,000,000
Cost of Goods Sold	
Material	1,045,000
Direct Labour	320,000
Production Overload	64,000
Research and Development Expense	203,000
Administrative Expense	235,000
Net Income	133,000

EXHIBIT IV

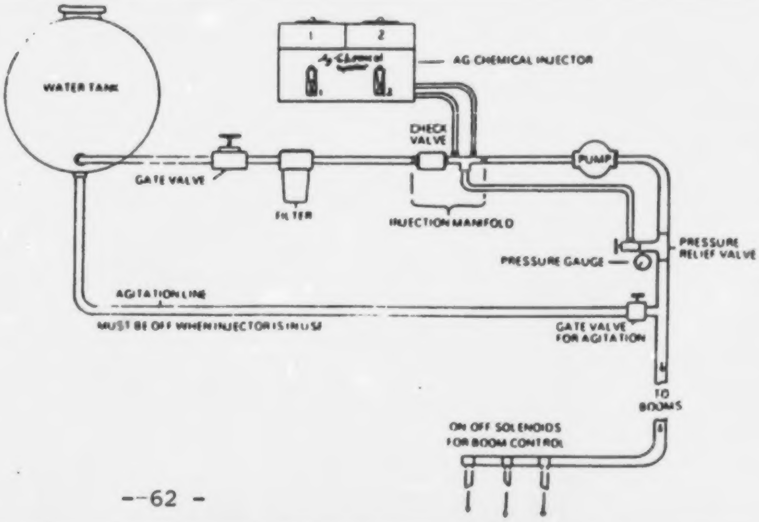
Ag-Chemical Injector
Ag-Chemical Injector

"The Manufacturer has provided a limited warranty on the Ag-Chemical Injector. A Purchaser should consult the Operator's Manual provided with the Ag-Chemical Injector for particulars and should also carefully review the instructions set out in the Operator's Manual in respect of the installation, use and maintenance of the Ag-Chemical Injector before commencing the operation of same."

Printed in Canada

Universal Installation

with all the necessary fittings supplied, the Ag-Chemical Injector can be easily installed on any sprayer, old or new.

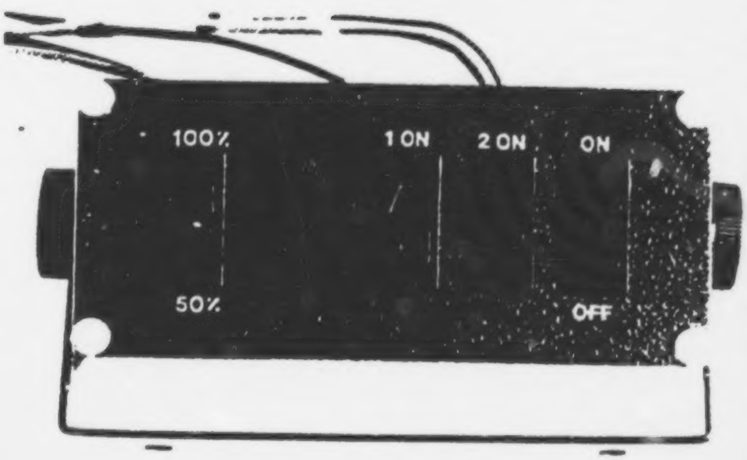

WATER TANK
1
2
Ag-Chemical
AG CHEMICAL INJECTOR
CHECK VALVE
GATE VALVE
FILTER
INJECTION MANIFOLD
PUMP
PRESSURE RELIEF VALVE
PRESSURE GAUGE
AGITATION LINE
MUST BE OFF WHEN INJECTOR IS IN USE
GATE VALVE FOR AGITATION
TO BOOMS
ON OFF SOLENOIDS FOR BOOM CONTROL

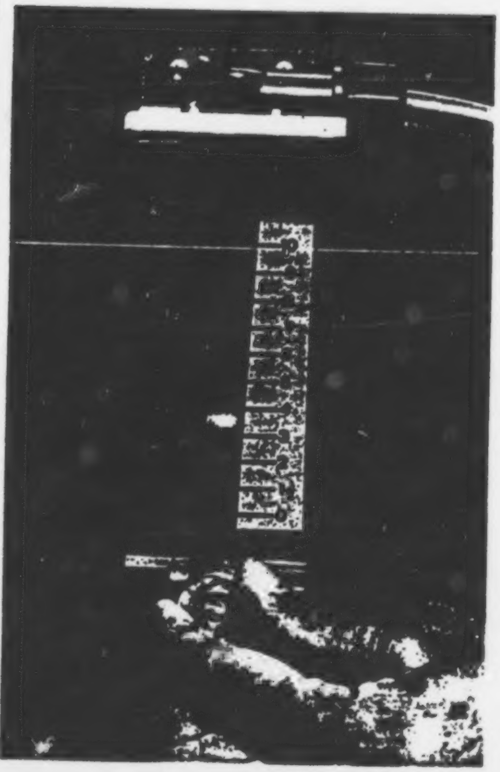
No Wasted Chemicals

Unused chemical is not contaminated with water, and can be returned to its original container for storage and future use.

Remote Switches

From your tractor you can apply 1 or 2 chemicals either together or individually. Spot application of selective chemicals can be done with the flick of a switch.





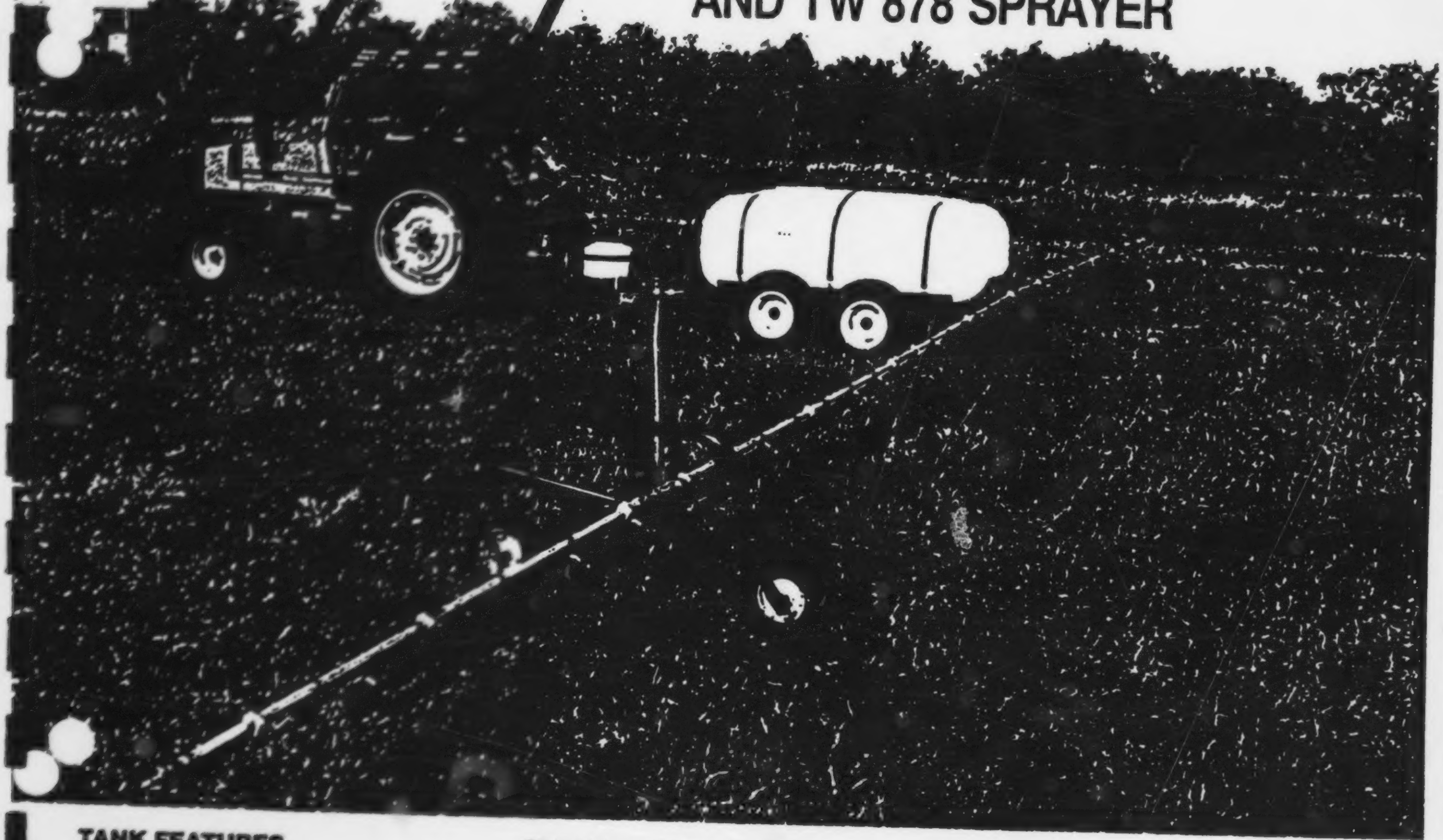
Linear Flow Meters

Chemical calibration is done by the manual calibration of the flow meters. This feature allows for calibration of your chemicals separately from the water. It all adds up to more flexibility when applying agricultural chemicals.

Ag-Chemical Injector

EXHIBIT V

MODEL TW 868 AND TW 878 SPRAYER



TANK FEATURES

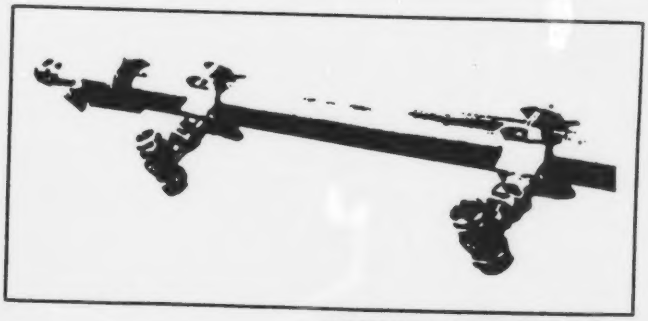
- New low profile tank for easier filling capacity 3600 L 800 Imp. gallon Poly tank
- Large 16" filler opening enables user to reach any part of interior for cleaning.
- Positive seal and vented tank lid.
- Strainer on 1½" suction line, easily removed for cleaning.
- Easily reached shut-off valve at tank.
- 4 Jet agitators provided to give adequate mixing.

SPRAY FLOW FEATURES

- Solenoid valves let you spray left or right from tractor cab.
- High capacity 540 or 1000 RPM Pump
- Valves and fittings selected to minimize flow restriction.
- Quick hose release at pump.
- 1" relief valve
- Pump equipped with mounting bracket for extended bearing life.

BOOM FEATURES

- Clamp on Tee-Jet Nozzles Model 17560 and 80 degree stainless steel tips.
- Two headland nozzles supplied, with shut-off valves.
- Easily adjusted for forward spray. Constant nozzle angle incorporated.



MODEL 17560

Quick Jet Nozzle Assembly features an integral diaphragm check valve providing positive

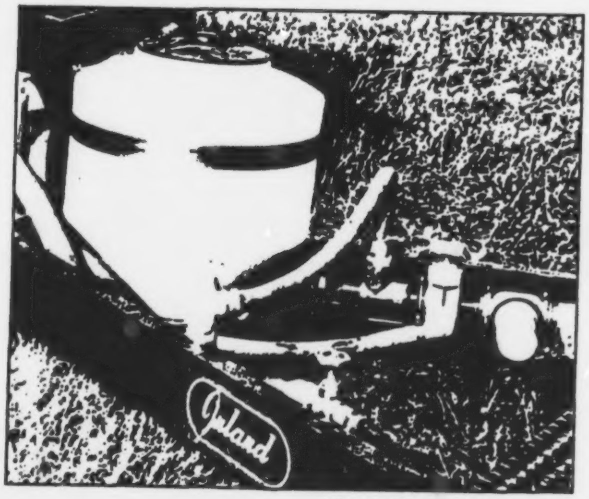
DOUBLE NOZZLE KIT (OPTIONAL)

#21171 Rolover Valve

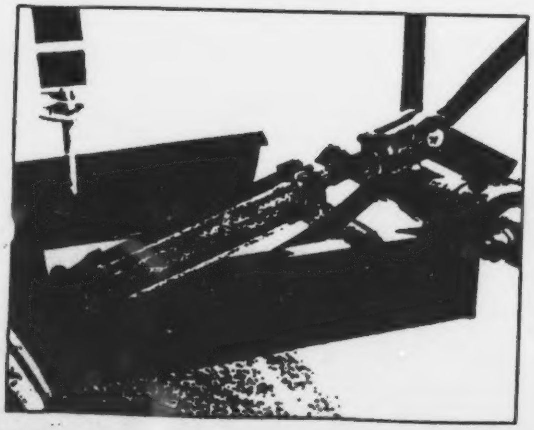
Consists of a Rolover Valve, which can accommodate two sizes of sprayer tips. NO TOOLS REQUIRED, just rotate 180 degrees and spray with alternate nozzle. No second boom required. LESS SPRAY TIPS AND

Here is the sprayer with all the features farmers have asked for including 1" aluminum booms, clamp-on Quick Jet nozzles, solenoid valves, low profile tank, 2-5/16" ball & socket hitch, easy turning heavy duty screw type jack, 3" truss boom, tank agitator, Tandem wheels.

Quick change from transport to field position. No pins to remove, no tools required.



Mix & Fill Tank is Standard.



Manual boom height adjustment cylinder is supplied, but a standard 8" Hydraulic cylinder may be incorporated.

Manufactured by: **Inland Steel & Forgings Ltd.**
675 Washington Ave., Winnipeg, Manitoba R2K 1M4
LITHO'D IN CANADA

EXHIBIT VI

SECTION III

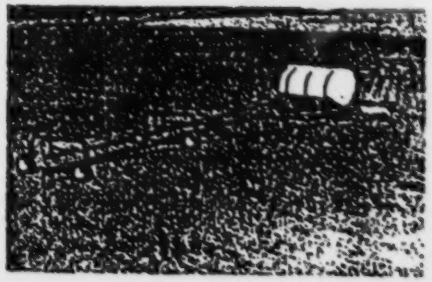
FIELD SPRAYERS GRANULAR APPLICATORS AND FIELD MARKERS

BLANCHARD FIELD SPRAYERS

800 and 500 gal. models in 60 to 100' widths. Tandem walking axle undercarriage with floatation tires. Field to transport position in minutes. 2-wheel boom stabilizers feature All Terrain Vehicle Tires or trailer type tires. Options include double boom, mix and fill chemical system and nozzle selection.

AUTOMATIC SPRAYER CONTROLS: Precision electric and electronic sprayer controls — sprayer monitors, sprayer controllers and brilliant sprayer markers plus automatic pressure and flow adjusting valves.

Spray Monitor
Spray Control
Spray Marker



Blanchard Foundry Co. Ltd., Saskatoon

Reply Code BL-03

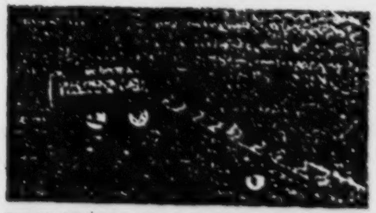
BRANDT FIELD SPRAYERS

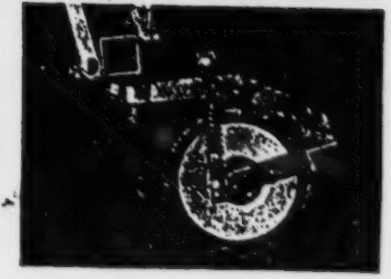
- Tanks available in 420 Imp. Gal. (500 U.S.), 620 Imp. Gal. (750 U.S.), 830 Imp. Gal. (1000 U.S.)
- Booms available in 60' width with new unique 26' extension kit, which can be installed in minutes.
- Sprayer has a step side to make filling convenient.
- 1" aluminum spray pipes are used for uniform boom pressure at the boom.
- 420 gal. and 620 gal. tanks are standard with a side fill feature.
- Sprayer nozzles are always pointing down at any height, to eliminate excessive field adjustments.
- Optional — Hydraulic Boom Lift
  Optional — Chemical Fill Tank
- Optional — Hydraulic Centrifugal Pump
- Welded boom struts to reduce set up and adjustments, and to ensure consistent spray pattern.

Brandt Industries Ltd., Regina

Reply Code BR-05

WILGER FIELD SPRAYERS 400 SERIES





FEATURES: 400 Imp. gal. low profile stainless steel tank c/w special sump and agitator. Ni-Resist 1700 roller pump. Heavy duty cart with tandem walking axles. 2" ball hitch, adjustable fo various drawbar heights. 60-80' boom coverage. Quick jet nozzles. Booms equipped with special spring loaded trip releases. Field to transport in minutes.

FLOW RIDE: Exclusive sprayer boom suspension system on all Wilger sprayers. Spring and shock absorber suspension virtually eliminates boom bounce for smoother more precise spraying at higher speeds.

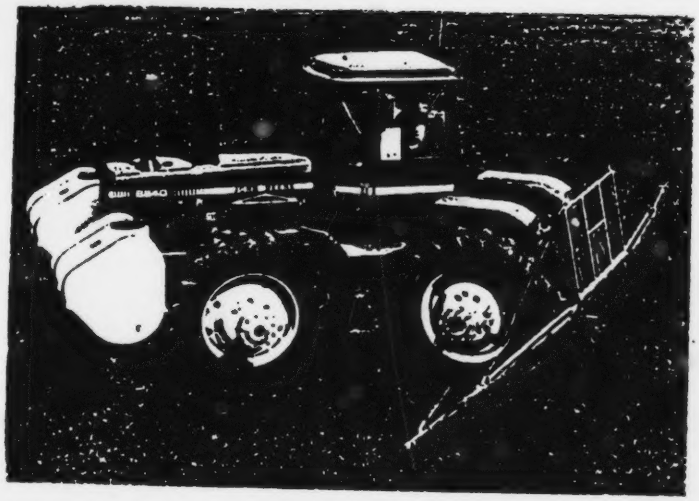
OPTIONS: Wilger sprayer monitor. Electric on/off boom control with remote pressure adjust. Auto mark dye marker and dye concentrate.

Wilger Industries Ltd., Saskatoon

Reply Code WR-03

EXHIBIT VII

TPH-BOOMS



Constructed of 1¼" square tubing, this boom is flex wire rope cable supported. Spring-loaded breakaways return boom to normal spraying position after impact with objects. Mounts to category 2 or 3 hitches and folds vertically for transport. Nozzles and boom feed hoses should be ordered separately.

Part No.	Description	Price
001051	28' TPH Boom 17 outlets at 20"	$625.00
001052	35' TPH Boom 21 outlets at 20"	798.00
001053	40' TPH Boom 25 outlets at 20"	825.00
001054	47' TPH Boom 29 outlets at 20"	863.00

Ask for our full color brochure and the dealer nearest you!

TEACHING NOTE & PRACTITIONER GUIDE

WINTEC ELECTRONICS (A)

WINTEC ELECTRONICS (A)

Teaching Note and Practitioner Guide

Synopsis

The case describes the situation of an electronics manufacturing firm which has engaged in research and development of a new product component -- a control panel for a chemical injector to be attached to agricultural sprayers -- on a contract basis for another company. Wintec hopes to recover its R & D investment and make a profit on manufacturing the new part, but the purchaser has ceased marketing the system and therefore is not placing production orders with Wintec. Management must evaluate the situation and decide what action to take regarding this product, and possibly review the company's new product development policies.

The case gives details on (1) background of the company and its entrepreneurial owner, (2) development of the control panel and product characteristics, (3) the agricultural sprayer market and (4) environmental factors.

Teaching Objectives

This case would be suitable for the new product development portion of an introductory marketing course, or for the strategy section of an industrial marketing course. Major objectives are:

1. To illustrate some of the problems involved in getting a new technological product into the marketplace.

2. To explore the steps of the new product development process, and to address the issues of establishing priorities for R & D and marketing effort/expenditure for a successful, small, innovative, but resource limited firm.

3. To identify the kinds of analyses required in developing a launch strategy for a new product.

4. To investigate issues of company strengths and weaknesses; market structure, size, and growth rate; market segmentation, buyer behavior and technological change.

5. To identify the factors that are associated with new product success/failure.

Teaching Suggestions

1. A good opening discussion might focus on an appraisal of the overall market potential for the Ag-Chemical Injector. This should involve an assessment of product strengths and weaknesses, and possible overall sales.

2. The instructor may wish to ask the class why this problem has developed for Wintec. The discussion should go beyond the obvious matter of no legal/financial safeguards built into the contract, to consider the common problem of technical expertise and focus combined with insufficient marketing emphasis.

3. Once the class has a good grasp on Wintec's strengths and weaknesses, the instructor could introduce the question of how these can be used as the basis for an effective R & D policy and overall marketing strategy.

Specific Questions

1. What is the new product development process for Wintec, and how effective is it?

2. What are potential criteria the company could use in determining the acceptability of an R & D project? How should an R & D organization incorporate market analysis into project selection and technical development?

3. Is there any way Mr. Williams can use his initial entrepreneurial strategy?

4. If Wintec is to try to market the control panel, what market analysis can he perform, and how should he proceed - what marketing mix?

5. How serious would writing off the financial investment be to Wintec? Can the company afford risks such as this?

6. What is the next step for Wintec's new product?

Analysis

1. What is the new product development process for Wintec, and how effective is it?

The process used by Mr. Williams in developing initial business with Versatile Farm Equipment Company can be described as below, however steps {d} through {g} are not described in any detail in the case.

(a) find client with a problem (or need)
(b) pre-sell the product concept (or technological solution)
(c) design and technical development
(d) lab testing
(e) modify
(f) re-test

(g) field test at client
(h) set up facilities to fill production orders from client

It is likely that Mr. Williams used this same approach in developing a prototype product and eventual production component models to serve the needs of Controlled Environments Ltd. The approach used to develop the control panel for Can-Spray's new Ag-Chemical Injector system appears to have followed similar steps to those outlined in (a) through (h) above. However, Wintec is experiencing few production orders from the client, perhaps due to (i) poor performance of the early formats of the Ag-Chemical Injector when Can-Spray launched them on the market and (ii) financial difficulties experienced by Can-Spray.

There are several advantages to the new product (R & D project) development process employed by Wintec:

(a) The early stages of Wintec's new product development process are very brief. Very little time is spent in finding an idea and in concept testing it. This shortens the process.
(b) Wintec has no marketing responsibility - it can focus entirely on technical aspects, which it does very well.
(c) The product is presold. This should mean guaranteed sales.

However, there are certain disadvantages:

(a) Wintec has no guarantees of or knowledge on client's stability and ability to pay.
(b) Wintec has no knowledge of the future viability of the client's product. Therefore it has no idea of immediate potential sales and long term prospects for its component products.
(c) Wintec has no protection for money invested; it has no way to recover funds if no production orders are placed.

In sum, Wintec is entirely reliant on the reputation, ability, and enthusiasm of its clients. Since Wintec does not investigate and qualify prospective clients it places itself in a high risk position. Ths risk is particularly high where clients are not well established firms with adequate financial resources and with sizeable markets for proven products {e.g. Versatile brand tractors}.

It is useful to contrast Wintec's approach to developing new products (R & D projects) with the normative (how it should be done) process outlined in Figure 1. The essential messages behind Figure 1 are that: (i) new product development should follow a series of incremental stages from the birth of an IDEA through to LAUNCH of the product to the marketplace; (ii) each stage should be accompanied by attention to both technical/production activities and by marketing analysis/marketing research activities and (iii) there should be evaluations conducted periodically or after each stage in the process to decide whether the project should be killed (a "no-go" decision) or continued on to the next stage (a "go" decision) -- the goal is to drop poor, high failure likelihood projects before the product developing firm incurs large sunk costs and to continue only those projects which continue to look attractive from technical, market and financial perspectives -- in summary, there must be an incremental and balanced approach to new product development. Comparing Wintec's approach to the normative framework outlined in Figure 1 leads to the general conclusion that Wintec concentrates on the technical/production activities and relies upon (assumes that) the client is taking care of the marketing analysis and plans. This "sharing" of new product development tasks seems to have worked well in the past with the Versatile Farm Equipment Company (a more established, market proven product) and with Controlled Environments Ltd. However, the situation presented in the case for the R & D project with the Can-Spray client indicates that Wintec's "sharing" approach has led it into difficulties: there appear to be problems with the marketing side (low level of market demand; inadequate marketing effort) and the technical side (poor field performance of initial formats of the Ag-Chemical system).

Figure 1 can be used as a focal point for a thorough critique of Wintec's approach to new product development. Students can be asked to identify the activities (if any) carried out by Wintec or its clients at each stage of the process in Figure 1 and the evaluations (if any) that appear to have taken place at points in the process. Some selected issues are elaborated upon in the analysis of the remaining discussion questions for this case.

FIGURE 1

A NORMATIVE MODEL OF THE NEW PRODUCT DEVELOPMENT PROCESS

STAGE	TECHNICAL/ PRODUCTION ACTIVITIES	MARKETING ANALYSIS MARKETING RESEARCH ACTIVITIES
IDEA GENERATION:	.Technology "push"	.Market "pull"
SCREENING:	.Fit with technical/ production skills, resources	.Fit with marketing competences .Market attractiveness
PRELIMINARY ASSESSMENT:	.Initial technical appraisal	.Quick market study
CONCEPT:	.Technical concept development (sketches, models, description)	.Concept identification market study .Concept test among key potential buyers
	(Preliminary business analysis)	
DEVELOPMENT:	.Design and prototype development	.Development of formal marketing plan. (More buyer behavior and competitor research).
TESTING:	.Prototype tests in-house ."Finalize" product design	.Prototype tests with users ."Finalize" marketing plan
TRIAL:	.Pilot production Modify design, process	.Test market .Modify market mix
	{Pre-commercial business analysis}	
LAUNCH:	.Full scale production .Measure, modify	.Execute marketing plan .Measure, modify

2. What are potential criteria the company could use in determining the acceptability of a R & D project? How should a R & D organization incorporate market analysis into project selection and technical development?

Potential criteria:

In addition to assessing technical feasibility, Wintec needs a clear understanding of the end-user market for the product: market size, segments, buyer needs and behavior, channels of distribution, competitors and their marketing plans, etc. have to studied. Estimates of prospective sales (including market share) over both short and long term would help Williams to assess whether this product will provide enough production orders to be worth his investment. Since he makes his profit selling a component part, Williams should have some reasonable assurance that the product as a whole will sell. The risk can then be weighed against the investment required, assuming that the prospective client is also taking at least an equivalent risk.

If planning an aggressive marketing strategy in which Wintec will actively seek out clients, Williams may wish to employ a marketing staff of one or two to independently research prospective clients and products, as well as to research new market areas suited to Wintec's abilities. If he does not yet wish to set up such a marketing department, Williams should certainly require that a reasonably detailed, written marketing report be provided by prospective new clients who expect him to assume part of the risk. Some references for the client would be advisable also.

3. Is there any way Mr. Williams can use his initial entrepreneurial strategy?

The original strategy (of having a guaranteed market by selling the product, booking the order, and then designing the product) works well to reduce the risk of new product development. However, it is only effective with established main line OEM's (like Versatile) who are clearly capable of assessing the potential product's viability and of marketing it effectively. With smaller, new companies with no proven abilities or success record, this method requires Wintec to assume a more significant risk. Perhaps this risk could be offset by determining that only x% of the firm's R and D dollars would go into `high risk` projects, that marketing information as suggested in #2 be acquired, and that a reasonable portion of the investment risk be borne by the prospective client.

4. If Williams is to try to market the control panel, what market analysis can he perform, and how should he proceed?

a) Break Even:

selling price of control panel	$425
less direct costs	$300
contribution margin	$125 per unit

Set Up Costs = $75,000

$\frac{\$75,000}{125}$ = 600 units break even

Investment in R & D = $15,000

$\frac{15,000}{125}$ = 120 units to recoup investment

b) Market Size:

Manitoba = 20,000 farmers, half (10,000) own sprayers
Western Canada: Manitoba=20% of total, therefore, Western Canada = 50,000 sprayers. This product can also be sold as a retrofit, so new sprayers are not the only possibility

To Breakeven: $\frac{600}{10,000}$ = 6.0% of Manitoba market

or

$\frac{600}{50,000}$ = 1.2% of Western Canadian market

Basic breakeven's are not high, BUT Wintec must find a manufacturer to make a chemical injector system to fit its control panel, and, then find some way to market the complete system.

c) Looked at from an OEM's perspective:

final selling price	$1700
less dealer's 20%	340
price to dealer	$1360
less distributors 20%	272
price to distributor	$1088

If the manufacturer sells the entire system for $1088, and if we assume a markup on cost of 30%:

$$\$1088 = 1.3x$$
$$\$837 = x$$

So it costs the OEM $837 per unit to manufacture the injector. $425 goes to Wintec for the control panel, leaving $412 to cover manufacturing and assembly of tank, pipes, valves, etc.,as well as overhead. If this is considered reasonable, the manufacturer then has a contribution margin of $251/unit towards fixed costs and profit.

At a 5% market share in Manitoba (.05 x 10,000 = 500 units), this will total 500 x $251 = $125,500, which may or may not be enough to cover sufficient promotional effort to offset the initial negative impression farmers have received about this type of equipment.

d) Pros/cons to proceeding with the product.

Pro:

- product type is desired by farmers and Department of Agriculture
- product provides distinct benefits to farmer (see below)
- should be sufficient market in Western Canada if manufacturer will undertake promotion--an individual dealer or distributor does not have sufficient market prospect to warrant heavy investment in promotion.

Con:

- bad first impression to overcome
- market needs much education, which is an expensive proposition
- Wintec does not own the entire system. It just owns part of the control panel; it must sell an OEM on manufacturing a new system using Wintec's panel.

The student must decide, as Mr. Williams, whether he can make a sufficiently strong case for the product to persuade an OEM to take it on and whether it is worth the effort.

Comparison of Features & Benefits of the Ag Chem Injector and Conventional Batch Mixed Tank Sprayer

Chemical Injector Sprayers	Conventional (Batch Mixes) Tank Sprayers
Advantages:	Advantages:
-accurate dosage to crops -flexibility/versatility (2 chemicals, spot applications, variable concentration rates) -reduced chance of financial loss -reduced chance of environmental pollution -reduced operator effort	familiar reliable?
Problems:	Problems:
first launch was flawed; resulting in: -bad publicity/word-of-mouth -unreliable product/system -misapplication of chemicals -high perceived risk (severe consequences if system malfunctions)	-possible under or over dosing, resulting in financial loss through decreased crop yield or increased chemical application cost -financial loss from unused (dumped) chemical -environmental pollution from dumping

5. How serious would writing off the financial investment be to Wintec? Can the company afford risks such as this?

Although there is not a great deal of financial data available, the student can reach some conclusions.

The Current Ratio is $917,000 / $700,000 = 1.3. Which is a bit lower than the average of 2. This suggests that Wintec may have a liquidity problem - - certainly cash flow must be carefully monitored.

The Debt/Equity Ratio is $20,000 / $338,000 = .06. As the rule of thumb is a D/E Ratio of .5, Wintec has the possibility of increasing long term debt in order to finance expansion or meet a crisis.

Finally, the $15,000 invested in this product is about 11% of net income, and only 7% of the R & D budget. While this is not an insignificant amount, it should not be crippling to the firm if the investment is written off. However, two or three such writeoffs could be a serious problem.

6. POSTSCRIPT

In the fall of 1985 Mr. Williams attended a marketing management class in which students discussed the Wintec (A) case. After listening to students analysis of the case, he commented on the recent history of Wintec's involvement with the new product and with the Can Spray firm. Some points raised are presented below.

- He did depend on Can Spray for market analysis (he lacks the staff to do this analysis).

- He likes to work with OEM's and people who are committed to their product and whose analysis can be believed. He was not too impressed with Can Spray's analysis. That's why he got Can Spray to put up one-half of the development costs.

- He is convinced that there is a need for the Ag Chem Injector system .....relative to conventional systems it decreases costs, increases convenience and reduces environmental impact; also it is more flexible and versatile.

- He decided not to go ahead with the product himself. He did not feel Wintec had the marketing expertise and he did not want to get into a "rights battle" with Can Spray. He felt such a battle would cause negative publicity among OEM's, a small community in Manitoba.

- Can Spray, had trouble raising funds for production and marketing. They approached various investors (including Wintec). They got some money from investors (but not Wintec) and from the Manitoba government venture capital program.

- Can Spray ordered 1000 control panels from Wintec in the spring of 1985. Wintec built these on spec. As of the late fall of 1985 Wintec still has 200 to 300 unsold units in inventory.

- Can Spray marketed the injector systems via agricultural equipment distributors to attempt to capture the retrofit market. Their timing was poor. The units were not available until May which was too late for the spraying season.

- As of fall 1985, Can Spray wants Wintec to make more control panels for use on injector systems for the 1986 spraying season. Mr. Williams is reluctant to do this unless Can Spray puts up the money up front. Can Spray does not appear to have the money.

- Mr. Williams mentioned that the present Ag Chem Injector system is only an "interim" product. It has the switch for choice of chemicals on the tractor but the calibration and metering system and controls for varying application rates are mounted on the sprayer. The ideal system would have all controls mounted on the tractor (to lessen operator effort and time). The "ideal" system would require about $30-40,000 additional R & D investment.

- Mr. Williams felt that inventors don't realize the extent of R & D investment required to make/design a product. They are usually not capable of or willing to fund the R & D costs on their own, hence they approach firms like Wintec to share or incur all the R & D costs.

- He emphasized that he (Wintec) put a lot of "extra effort" into R & D. He wants to get the product right. He has had an excellent success rate.

- However, he admitted that he would have to be more selective in taking on entrepreneurial projects. He is tightening up his screening process for new R & D projects and is moving towards more formal agreements between Wintec and inventors/entrepreneurs/marketers.

GENERAL PRINCIPLES {MESSAGES} TO BE LEARNED BY SMALL, TECHNOLOGICAL NEW PRODUCT FIRMS

Based on the situation presented in the Case and on the issues raised in the analysis, the following generalizations can be drawn:

1. THE "FIT" BETWEEN THE COMPANY AND THE NEW PRODUCT OPPORTUNITY MUST BE CAREFULLY ASSESSED.

Wintec's strength is its knowledge of technology and electronic component design and manufacturing. It used this strength to its advantage in developing business with the established Versatile Farm Equipment Company upon whom it could rely to take care of marketing of the finished product. This sharing of tasks appears to have worked well. However, the situation is different with Can-Spray, a relatively new, inexperienced and financially shaky client. The opportunity to develop a component for Can-Spray is a good "fit" with Wintec's technical/production capabilities but it is a poor "fit" in terms of Wintec's marketing knowledge and skills. Wintec is vulnerable if its "marketing arm", Can-Spray, falls down in market research or in executing marketing strategies. This is exactly what has happened. If Wintec wishes to stick to its area of distinct competence (technical issues), then it must carefully research and screen the partners (clients) with whom it gets involved. This is a message of importance to many "marketing weak" technological product businesses.

2. STEPS IN THE NEW PRODUCT DEVELOPMENT PROCESS MUST NOT BE SKIPPED AND A BALANCE MUST BE MAINTAINED BETWEEN TECHNICAL/PRODUCTION ASPECTS OF DEVELOPING NEW PRODUCTS AND THE MARKETING RESEARCH/ANALYSIS ASPECTS.

Wintec concentrated upon the technical/production aspects of new product development and it assumed that is partner/client, Can-Spray, would look after the market analysis/marketing research activities. Wintec skipped the screening for marketing "fit" and it should have insisted upon early performance in-use tests of Can-Spray's system with actual customers. The initial formats of the Ag-Chemical Injector that were marketed were flawed and served to generate a negative product image in the market. Firms must appreciate the interrelated nature of the technical and marketing analysis activities associated with new product development. Market inputs (e.g. users' experience with prototypes) are vital to the creation of a successful new product design. Time and money invested in a market analysis/market research activity often pays huge returns.

3. THE CONCEPT OF DERIVED DEMAND MUST BE UNDERSTOOD.

Wintec will only sell control panels if Can-Spray is successful in selling its Ag-Chemical Injector system. That is, the demand for Wintec's component product is derived from demand for the final product system produced by another manufacturer. Also, it can be said that the demand for the Ag-Chemical Injector system is derived from (dependent upon) the demand for new agricultural sprayers and the demand for retrofit applications to existing sprayers owned by farmers. All component suppliers and most industrial marketers face a derived demand situation. In such situations, the firm must monitor and understand conditions in the final product market, since its livelihood depends on its customers' (clients') product achieving success in this final market. If a component supplier "hitches its horse" to a weak client firm, it will experience low demand, as is the situation with Wintec.

4. MARKETS AND COMPETITION MUST BE ANALYZED. FINANCIAL FEASIBILITY STUDIES MUST BE PERFORMED.

Wintec had not performed the analysis of market size, growth rate, break-even sales volumes and market shares that are outlined in the analyses for this case. Such analysis are vital to determining a course of action and they should be carried out by all firms contemplating marketing of a product.

5. BUYER BEHAVIOR MUST BE UNDERSTOOD.

Part of determining whetheror not a product idea of concept represents a real opportunity is to address the question, "Does this product deliver any unique or competitively superior benefits or values to the end-user?" In the case of the Ag-Chemical Injector, the answer is probably, "yes." However, it might be argued that the next generation of injector system (one that allows for both the choice of chemicals and the flow calibration/application rate to be controlled remotely from the tractor) is needed before a sufficiently unique and superior product is obtained. Research has discovered that the most important factor in new product success is "having a unique and superior product." Firms would do well to bear this in mind and to take measures of buyers' perceptions of the relative value-in-use of the proposed new product. Often, the buyers' perceptions are a surprise to the technological new product firm which has a natural tendency to overemphasize the benefits of its own product. Understanding buyer behavior and perceptions is the key to developing a unique and competitively superior product.

6. USE FORMAL CONTRACTS, WHERE POSSIBLE, TO REDUCE THE RISK OF PRODUCT DEVELOPMENT.

Wintec has a "contract" with Can-Spray which leaves the rights to the Ag-Chemical Injector with Can-Spray but which apparently does not require Can-Spray to buy a certain quantity of the control panels from Wintec. Therefore, Wintec has no assurances that it can recoup its R & D investment. It did, however, require Can-Spray to put up one-half of the initial development costs and, as indicated in the Postscript to the Case Analysis, seems to be taking a fairly hard line with Can-Spray on any future production orders; Wintec is insisting that Can-Spray put up money "up front" before more control panels are produced. Perhaps, the requirement of having the client pay all or part in advance to finance Wintec's production of components, should have been included in the original contract. Small firms are often in a weak position to demand extremely self-serving contract clauses, however, they should attempt to do so, particularly when dealing with non-established clients.

7. CHANGES IN THE TECHNOLOGICAL AND MARKETING ENVIRONMENT MUST BE ANTICIPATED AND ANALYZED.

The ecological, economic and regulatory/political environments favors the use of more precise farm chemical application systems and equipment, and hence are working to stimulate demand for Can- Spray's product and (due to derived demand) Wintec's component product. Analysis of changes in technological and marketing environments can create opportunities for businesses; such changes can also destroy markets, products and firms. Firms, especially small ones, must seek out situations where factors in the uncontrollable and changing environment are in a favorable position. Can-Spray and Wintec can be complimented for anticipating favorable trends.

8. MARKETING TASKS AND PLANS MUST BE PERFORMED BY SOMEONE AND THEY MUST BE EFFECTIVELY CARRIED OUT.

If Wintec wishes to define itself as a custom R & D design and manufacture-to-order business, it must link up with a client ("marketing arm") which is both knowledgeable and proficient in marketing. The marketing tasks must be performed; they cannot be eliminated. Small, engineering/technical type firms tend to underestimate the importance of marketing in the success of new products. They tend to believe that a good product will sell itself, and often this is their downfall. Wintec, perhaps more than many firms of its type, seems to realize the importance of marketing. At least it does so in retrospect. The president admits that his firm's strengths are not in the area of product marketing and he now realizes that he was overly naive in uncritically accepting that Can-Spray had the skills and resources to do a good marketing job on the Ag-Chemical Injector unit.

9. SUCCESSFUL NEW PRODUCT DEVELOPMENT AND MARKETING REQUIRES COMMITTMENT OF CONSIDERABLE TIME, SKILL, AND RESOURCES.

Wintec is fortunate that it has an established custom business to allow it to withstand a possible bail-out on the control panel component. Alternatively, Wintec can afford to devote more time and resources to the control panel/Ag-Chemical Injector business. Many other small, new firms do not have this luxury; their whole survival may depend on a single new product venture.

Firms which are new to the new product development game must realize that there are few overnight successes. Management must be prepared to endure unanticipated hardships and setbacks which often occur, even for the most promising looking new product concepts.

Section 4

CASE STUDY:

WINTEC ELECTRONICS (B)

WINTEC ELECTRONICS (B)[1]

In early 1985, Mr. Frank Williams, President of Wintec Electronics Ltd., was considering the long term prospects for his business in the satellite dish positioner market. The positioner controls developed by Wintec, an electronic design and manufacturing firm located in Winnipeg, Manitoba, presently formed about 30% of the company's sales. Mr. Williams felt that to remain competitive in the highly technological dish positioner field, he would need to greatly expand Wintec's operations. However, satellite equipment was a cut-throat market with which he was not very familiar. "What is the future of this product?" he wondered, "and how does it fit with the future I want for Wintec?"

Company Background

Mr. Williams, a professional engineer with many years experience in electronic design, had started Wintec Electronics in the basement of his home in 1978. He sought contracts from manufacturers, offering to design and build a new or improved control or part for an existing product, on a produce-to-order-basis. That is, he made the sale before producing the item. After two years working from his home, the business was successful enough to move into government subsidized Advance Factory Space, and by 1982 had moved again to new and larger premises as an independent design and manufacturing firm. In 1985, the firm's annual sales volume was $2.0 million and a staff of twenty-six persons were employed.

The company produced 40 different products, serving five corporate customers in three different market areas. About 30% of the work was in electronics for agricultural equipment, including dashboard control panels, sensing devices, and instrumentation electronics. Another third of Wintec's sales was electronic controls for industrial/scientific research equipment -- primarily an electronic control panel for an environmental growth chamber for plant science research, and a set of computerized machine controls for industrial machinery. The firm had been successful in these areas,

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[1] This case was prepared by Morva Bowman, M.B.A., under the supervision of Dr. Dennis Anderson as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Support for the development of this case was provided by the Technology Division, Manitoba Industry, Trade and Technology; Management Excellence in Small Business Program, Department of Industry Trade and Commerce, Ottawa, and Canadian Studies Program, Secretary of State, Ottawa.

often as a result of the direct sales efforts of Mr. Williams -- in virtually all cases Wintec dealt directly with a single OEM. The third area of production was the satellite dish positioner, which was a more recent, but rapidly growing, addition to the product line.

All marketing activities were handled by Mr. Williams. The new product development process was not a specific program, but occurred in response to requests from existing or potential customers or in response to a sales pitch made by Mr. Williams. Products were developed only when Wintec had an assured customer. Wintec priced its R & D at or below cost in order to compete with larger firms of greater resources -- Wintec's profit lay in manufacturing quantities of electronic control components to supply to OEM's as market demand developed for their final products. If demand for the OEM's product did not take-off, Wintec might not recoup its original R & D (sunk) costs.

Mr. Williams identified several problem areas for the firm. "We are very vulnerable to a slow-down from one of our major customers, which could cut production by as much as one-third. We need more customers in each area. Because we are growing, we are also experiencing limitations on cash flow and production capacity."

(For more information about company background, see Wintec Electronics [A]).

Development of the Positioner Control

Wintec Electronics produced a dish positioner -- a control box which directs the actuator or motor drive on a satellite dish to sweep the dish in an arc along the line of all the geostationary satellites servicing North America. It permitted the user to change from one satellite to another without having to go outside and manually adjust the dish. (For an explanation of how home satellite TV systems operate, see Appendix A).

Wintec had developed the positioner under an agreement with SatScan Systems, who purchased the product. SatScan had approached Mr. Williams in mid-1981 to propose the project. It had taken eight months and an R & D investment of $50,000 to bring the positioners into production, but by 1985, Wintec was manufacturing 5,000 units/year. As SatScan had contributed only 10% of the R & D costs, the design was Wintec's property. However, no legal agreement existed to prevent either SatScan or Wintec from going elsewhere without discussing the proposed change in advance.

Dish positioners were relatively new on the market -- within the last three years they had become increasingly popular additions to formerly manually controlled systems. In the past, dishes were moved by a handcrank, or by a motor drive (actuator). In both cases, the operator had to go outside to alter the dish position. With a positioner, the dish position could be automatically and precisely controlled from inside the house. Wintec manufactured three positioner models in 1985. All were basically similar, but the middle and higher priced units offered more "refinements" than the lower-end model, (for example, a wider range of automatic channel selections, lock-on and pre-programmable features -- basically, increased flexibility).

The low-end model accounted for about 60% of Wintec's current positioner production, with the remainder in the medium-price version. The most expensive positioner was just entering production, so sales figures were not yet known. High-end, more expensive systems formed only about 10% of the total market for dish equipment at this time. Wintec priced the units at $100, $150, and $200, and tried to maintain a 30% markup. However, due to production inefficiencies, this sometimes slipped to 20%. SatScan assembled the positioner manufactured by Wintec with an actuator (the motor drive which moves the dish) purchased from another supplier, and the necessary cables and connectors, and sold the completed packaged product through several distributors. Mr. Williams estimated that SatScan maintained a 25% markup on the package, but was not sure how much the other components would have cost.

SatScan's function was to assemble component parts and market the finished product. Wintec could consider doing all of this in-house, but Mr. Williams's preferred to keep his company as a manufacturer and not make moves towards becoming "a commercial marketer". Also Wintec's limited human and financial resources, did not permit development of an extensive marketing effort.

The Satellite Television Marketplace

Mr. Williams estimated that the annual market for satellite dish equipment in North America was between 500,00-1,000,000 units. About 10% of this was Canadian. As of early 1985, there were one million existing dish owners in North America. Market growth rates were predicted at anywhere from 20% to 100% per year over the next five years, although the past year had been relatively slow -- only about 15% growth. The industry was only six years old so there was still plenty of room for growth. For example, Mr. Williams felt that of the possible rural installations (which were the first customers to be interested in satellite equipment), the Western Canadian market was 15-20% saturated. Eastern Canada had only recently begun buying this product, and he estimated approximately 5% saturation. The urban markets were at much lower levels, as cable TV services available in major cities had thus far made the dish system seem an expensive alternative. However, equipment prices had dropped significantly over the past five years, and city dwellers were becoming increasingly interested in satellite TV.

A complete dish system might sell for between $2,500 and $4,000. The receiver was the most expensive component -- a top quality receiver might be priced at $1,100. The actuator and positioner ranged from $425 to $750 for the pair. A good quality ten foot antenna dish would cost about $850, plus another $350 for the low-noise amplifier. Addition of the antenna mount, feed horn, down converter, cables, wiring and installation contributed another $1000 to the bill. (See Exhibit I for sample brochure).

When making a purchase of such size and technical complexity, buyers were naturally cautious. As the dealer was responsible for correct installation and servicing, purchasers looked for a reputable, well-established dealer. Buyers tended to shop around and do a lot of price comparison; as well, they consulted some of the many magazines and books offering advice on the subject. The entire purchase process could take several months.

A recent U.S. survey of dish owners showed a trend towards increasing use in urban areas, which had begun to cause conflicts with established cable TV systems. Many dish owners decided to drop their cable subscriptions, causing loss of revenue to the cable companies. Cable operators were fighting back with PR campaigns discouraging dish purchases, and sometimes by pushing for zoning regulations to prohibit use of satellite equipment in urban areas. Most dish owners were heavy viewers, using their system primarily for entertainment purposes, and tended to be more satisfied with their systems than cable TV users were with their service. The profile suggested that these people were generally upscale, aggressive decision makers. (See Exhibit II).

No accurate information was available on the number of satellite equipment dealers or distributors in North America. The industry was growing rapidly, and many businesses entered the marketplace optimistically, only to go out of business six months later. In early 1984, over 30 firms advertised this equipment in the Yellow Pages of the Winnipeg telephone directory, but many of these were gone by the end of the year, to be replaced by new dealers. Three or four distributors supplied the Winnipeg market, but some manufacturers went direct to the dealers without the use of a distributor. Both manufacturers and distributors used company sales people, relying heavily on phone calls to make sales. they promoted extensively at trade shows. Distributors margins were between 10-20%, with dealers adding a further 20-30%.

SatScan marketed its products through distributors, but was not satisfied with distributors' performance. SatScan was considering going direct to dealers utilizing an existing company sales force of three persons. SatScan equipment was sold across Canada, although the firm was most successful in the western provinces. Marketing attempts in the U.S. had not been effective, and little effort had been made. In Canada the company advertised to the trade and to the end-user through magazines, newspapers, and trade shows, and their product was priced towards the medium-to-low end of the market price range. At present, SatScan sold only the positioner/motor unit, but the firm was in the process of setting up a sister company to act as a distributor for all types of satellite dish equipment.

Competition

There were only two or three other Canadian manufacturers of satellite dish equipment. All were located in Eastern Canada and focused on the Eastern Canadian and U.S. markets. However, Wintec's product was also in competition with dish positioners manufactured in the U.S. and sold across North America. Between American and "offshore" manufacturers -- particularly Korean and Taiwanese -- there were over 100 companies competing in this market. Many had very large R & D budgets and manufacturing facilities. As a result, equipment prices were dropping steadily and new and improved designs were constantly coming onstream. Mr. Williams considered that he could maintain the current prices of Wintec's positioners for a maximum of one year, but then would have to reduce them by at least 25% to remain price competitive.

Legal/Technical Factors

One issue concerned most dish owners: scrambled signals. Until recently, all satellite channels were broadcast unscrambled or without interference, and any dish owner could receive them. A few of the U.S. cable movie channels had begun or were threatening to scramble their signals, meaning that dish owners would have to buy or rent a decoder for each scrambled station they wished to receive. The fear that their expensive new system would be useless without an additional expenditure on decoders had kept many people from purchasing systems until the issue was settled.

The scrambling problem arose because of increasing urban interest in satellite equipment. Systems owned privately by persons living within a cable TV area were in direct competition with pay TV services. Therefore, a few of these cable operators had begun to test scrambling, with a decoder available through the pay TV service. However, most satellite dish dealers and other industry sources felt that the concern was over-rated. Only a handful of the many stations available were even considering scrambling their signals, so even if those stations found it economically feasible to scramble, there would still be plenty of choice for the home viewer. (See Exhibit III).

A technical change which could be of significance to Wintec was the development of integrated receiver/positioner units. These were easier to operate and provided many functions in one unit with one remote control, rather than two separate boxes and controls. Such units were becoming increasingly common as part of the more expensive, high quality systems, (about 9-10% of the total market). One dealer suggested, "Separate stand-alone positioners sell more often now as part of a low-end system, or as an add-on to an existing system. For top-of-the-line models, the customer wants as much of the equipment integrated as possible." The trend appeared to be toward consolidating components, the reverse of what had happened with stereo systems.

If Wintec was to compete by producing its own integrated receiver/positioner it would have to develop its own receiver technology since SatScan did not deal in receivers. Mr. Williams explained why he was reluctant to enter that area. "This would require a major R & D investment -- money we just don't have. Also, receiver technology is changing very rapidly, so it would be an ongoing problem to keep up. I'm not sure we have the resources to maintain that level of development." Another possibility would be to buy receivers from another manufacturer, and integrate Wintec's positioner. Although he had considered this option, Mr. Williams was not confident enough about his future place in the industry to investigate this in detail.

What Next?

It appeared that Wintec had to decide whether to be in the satellite dish industry, or to bow out gracefully. If Mr. Williams could not reduce the prices for his products within the next year, he would be forced out by competitors. However, in order to maintain margins with reduced prices, he felt that it would be necessary to install automated assembly equipment and increase production cost efficiency. "Economies of scale and learning curve effects would operate to reduce my per unit costs of manufacture -- if I can increase production volumes substantially," he said.

Mr. Williams estimated that the required equipment would cost $200,000, and he would need to double his factory space, at an additional cost of $30,000 per year. Staff increases would also be necessary. He thought that he would have to hire 15-20 new people, at an average salary of $15,000 per yeer for each. For the expanded production system to be cost effective, Mr. Williams estimated that a minimum production of 25,000 units per year was necessary.

He had to reach a decision soon -- if Wintec was to stay in the market, expansion plans must be set in motion. Alternately, if Wintec was to bow out, it was imperative that Mr. Williams find new products to replace the 30% of sales which he expected to lose. "It's a large and growing market, and we have a foot in the door," he commented. "The question is -- can we continue to participate? And, do I want Wintec to get so heavily into this market that our other product lines are reduced to minor importance? The opportunity is tempting, but the risks are great."

EXHIBITS:

WINTEC ELECTRONICS (B)

WINTEC ELECTRONICS (B)

Exhibit I

Sample Satellite Receiver Brochure

Luxor
MPLETE SATELLITE TELEVISION S
MICROPROCESSOR SYSTEM
POSITION
WEST EAST STORE
SATCOM
WESTAR
COMSTAR
ANIK
OTHER
FUNCTION
ACTIVE
POL. INV.
CCW CW INV.
POLARIZATION
10
REMOTE CONTROLLED ANTENNA ACTUATOR
Luxor
DOLBY SYSTEM
SOUND SELECT
MONO STEREO
1 2 DIR. MTRX
AFC ON
OFF
TUNING
STORE
24
IR COMMAND RECEIVER
EXP DOLBY AUDIO SCAN
ON NR NB ON
OFF OFF WB OFF
ODD EVEN CHANNEL STEP
REMOTE CONTROLLED SATELLITE RECEIVER
Luxor
SATELLITE REMOTE COMMANDER
Luxor
Luxor

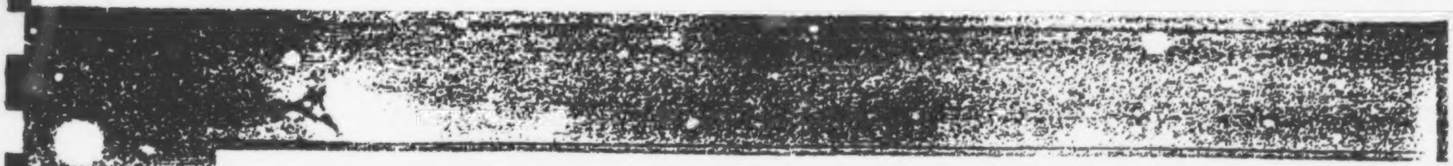
- Antenna Actuator
- Satellite Television Receiver
- Remote Commander
- Auxiliary Remote Sensor

Luxor

Luxor (North America) Corp.
Bellevue, WA

A leader in radio and television technology since 1923

FCC Approved



A Totally Integrated Satellite

Since the beginning of Satellite Television for in-home enjoyment, Luxor has been a leader in the development of high-performance, technically advanced satellite products. Only the Luxor Brand brings you such an extensive combination of electronic features and automatic controls. Superior quality in both design and construction brings you clear, bright, full-color video and life-like hi-fidelity sound reproduction. Here is the finest space-age technology for your home, at an affordable price.

THE LUXOR® 9550 REMOTE CONTROLLED SATELLITE RECEIVER

DOLBY SYSTEM
SOUND SELECT
MONO STEREO
1 2 DIR. MTRX
AFC
ON
OFF
TUNING
STORE
REMOTE CONTROLLED
SATELLITE RECEIVER
24
IR COMMAND
RECEIVER
EXP
ON
OFF
DOLBY
NR
OFF
AUDIO
NB
WB
SCAN
ON
OFF
ODD
EVEN
CHANNEL
STEP
LUXOR

The Luxor 9550 gives you total control over the satellite spectrum. Twenty-four channels can be selected, fine-tuned and programmed for automatic recall. Four different audio systems—Mono 1, Mono 2, Direct Stereo or Matrix Stereo can be selected for programming with any channel in either wide or narrow bandwidth. A built-in RF modulator provides easy connection to any television set. Other features include: Automatic polarization, two-speed scan, video inversion control, AFC Defeat, Dolby® Noise Reduction, Outputs for baseband audio and video. The 9550 is not only a satellite television receiver, it can also feed a hi-fi stereo system with quality audio-only signals. After programming all 24 channels on a single satellite, corresponding channels on all other satellites can be selected and they will automatically respond to the program. A built-in stereo processor for both TV audio and stereo sound-only eliminates the necessity for an external add-on stereo processor. No other system gives you such precise control ability. The world of satellite television is at your fingertip—automatically.

THE LUXOR® 9534 ANTENNA ACTUATOR

MICROPROCESSOR SYSTEM
POSITION
WEST EAST STORE
REMOTE CONTROLLED
ANTENNA ACTUATOR
SATCOM
WESTAR
COMSTAR
ANIK
OTHER
FUNCTION
ACTIVE
POL. INV.
CCW CW INV.
POLARIZATION
10
LUXOR

Here is automatic satellite selection at your command, by remote control. The location of 30 different satellites can be precisely defined and programmed into the 9534's microprocessor memory. Then at the touch of a button the 9534 guides your antenna to the satellite of your choice with remarkable ease and accuracy. The Luxor 9534 Antenna Actuator is design co-ordinated with the Luxor 9550 Satellite Receiver to give you automatic delivery of any selected channel from any satellite.

Television Reception System

WEST
EAST
ODD
EVEN
CHANNEL
SATELLITE
NORMAL
VIDEO
PREPROG AUDIO TUNABLE
CH STEP
AUDIO STEP
POL FINE
AUDIO TUNE
SATELLITE
REMOTE COMMANDER
LUXOR
LUXOR

THE LUXOR® HAND-HELD REMOTE COMMANDER

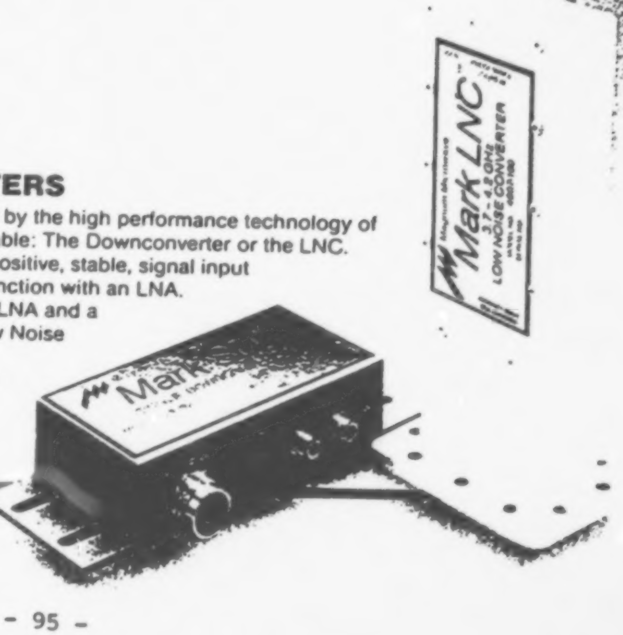
Once they are programmed, the 9550 Receiver and the 9534 Antenna Actuator can be completely controlled from your armchair by this compact (IR) Infrared remote control. No wires are necessary. You have automatic selection of all of the programmed satellites via the actuator. By activating the receiver control you can automatically recall up to 24 television channels.

THE LUXOR® 9536 AUXILIARY REMOTE SENSOR

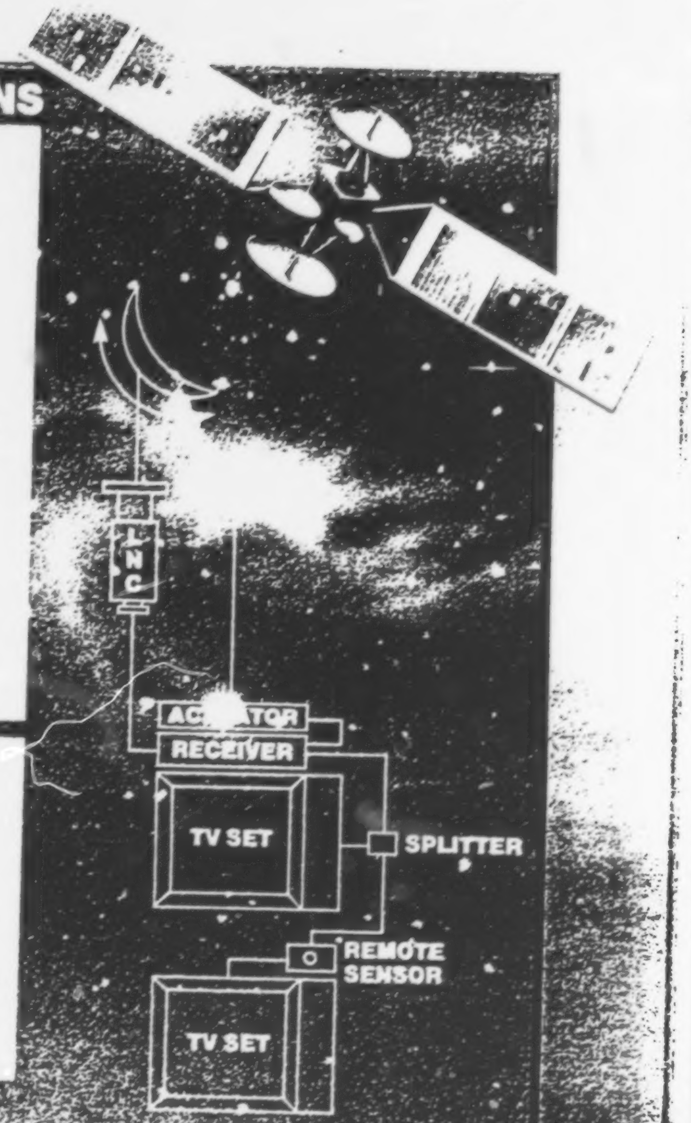
Other television sets, located throughout your home, can receive satellite television by the simple addition of the low-cost IR (Infrared) sensor at each set location. A hand-held Remote Commander can control the receiver and antenna actuator through the 9536 sensor from any location. You have completely automatic control from every TV set in the house. Other family members can watch locally transmitted television by switching from the satellite input channel (channel 3 or 4) using the individual channel selector on each TV set.

MICROWAVE AMPLIFIERS/CONVERTERS

The miracle of satellite television reception is made possible by the high performance technology of microwave amplifiers and converters. Two options are available: The Downconverter or the LNC. Each finely constructed unit is thoroughly tested to assure positive, stable, signal input to the satellite receiver. The Downconverter is used in conjunction with an LNA. The LNC is a cost effective dual function unit combining an LNA and a Downconverter in a single weatherproof housing. These Low Noise Converters are made to the highest standards of materials, workmanship and reliability. Quality, performance and value are assured.


Mark LNC
3.7-4.2 GHz
LOW NOISE CONVERTER
Mark

PRODUCT SPECIFICATIONS



9550 SATELLITE RECEIVER

Input frequency: 70 MHz
Input impedance: 75 ohm
Input connector: Type F
Remote control system: IR pulse-position system 30 controls 42 commands
Programmable channels: 24
Polarization control: Automatic for Chaparral polarotor
LNC power output: +18V
Scan: Included, 2 scan speeds
IF bandwidth (3dB): 25 MHz
Video output level (at 10.74 MHzp dev.): 1 Vpp
FM threshold (C/N 30 MHz): Less than 8 dB
Video output connector: Type F (75 ohm)
Programmable audio systems: Mono 1, Mono 2, Stereo direct, Stereo matrix
Audio noise reduction system: Dolby Type B
Audio IF bandwidth: Wide: 380 kHz Narrow: 180 kHz
Audio output level: 0.5 Vrms
Audio output connectors: Stereo: phone plugs (left and right) Mono: F-connector
RF output: FCC-standard
RF output frequency: US ch. 3 or 4
RF output impedance: 75 ohm
RF output connector: Type F
AC power input: 117 V 60 Hz
Size (L x W x H): 270 x 270 x 90 mm 10⅝ x 10⅝ x 3½ inches
Weight: Approx. 4.0 kg (8.8 lbs.)
Interface for aux remote system: +18 V on RF-output
Interface for accessories: DIN-connector

9534 ANTENNA ACTUATOR

Output Voltage for motor: ±36 V DC
Output Current: (stall condition) 6 Amps
Polarization Control: For Polarotor 1
Sensor System: For reed-switch
Control System: IR remote, via interface cable from 9550
Interface to 9550: DIN Connector
Memory Back-up: 2 AA-size batteries Lifetime: 2 years
Max Satellite Positions: 30 positions (6 each for Satcom, Westar, Comstar, Anik, other)
Controls on front panel: Position—East and West, Store button, Polarization CCW (counter clockwise), Polarization CW (clockwise), Polarization Invert
AC Line Voltage: 117 rms, 60 Hz
Size (L x W x H): 11" x 10⅝" x 2¾)
Weight: Approx. 3.6 kg or 8 lbs.

MICROWAVE AMPLIFIER/CONVERTERS

MODEL	DDC	SDC	LNC
INPUT FREQUENCY	3.7-4.2	3.7-4.2	3.7-4.2
GAIN	24dB	24dB	60dB MIN
NOISE TEMPERATURE	N/A	N/A	85°, 100°
OUTPUT FREQUENCY	70MHz	70MHz	70MHz
SUPPLY	+18V@ 150mA TYP	+18V@ 100mA TYP	+18V@ 140mA TYP

See the complete Luxor Satellite Television System for yourself. Ask for a demonstration. Tune in the world's largest selection of television entertainment—sports, news, movies, education, variety, musicals, comedy. Satellite TV is far beyond the ordinary.

NOW AVAILABLE FROM:

WINTEC ELECTRONICS (B)

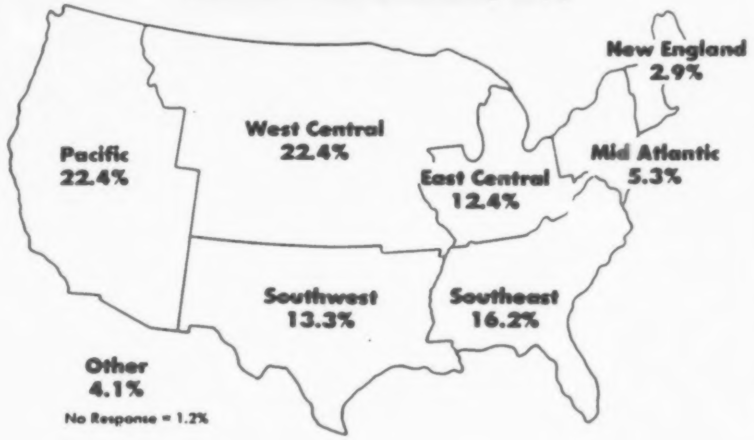
EXHIBIT II

U.S. Survey Results - From "Home Satellite T.V." Magazine, September 1985, pp. 11 - 12

COOP'S WORLD OF SATELLITES by Bob Cooper, Jr.

WHO OWNS THE PRIVATE EARTH STATIONS?

WHERE TVRO OWNERS LIVE



A funny thing happened on the way to the dish recently. We, the TVRO industry, finally stopped sticking dishes in the ground at a breathtaking pace long enough to measure who the people buying all of these home satellite terminals are. There were numerous surprises.

Here is how it was done. A major research/marketing company was employed to 'scan' warranty registration cards from five major manufacturers in the field. They selected some 4,800 home TVRO names and sent each a 4-page, comprehensive questionnaire. A shocking 43.6% of all of those receiving the unsolicited survey filled it out and returned it to the research firm. From the nearly 2,100 responses, answers to 43 separate questions were tabulated and a massive 150 page 'TVRO Market Profile' emerged. Here is some of what we learned.

A) *TVRO's Rural Nature Changing:* Everyone knows that the first buyers of backyard dishes had big back yards; they lived in the country! The profile tells us that 72% live 'outside city limits' of an incorporated community and 63% live 50 miles or more from a major city (population 100,000 or more). But, there is a trend, during the past 18 months, for more and more TVRO buyers to live inside of incorporated municipalities and in cities of 10,000 and up.

B) *TVRO's 'Conflict' With Cable Emerging:* As TVRO has 'marched into town,' there has been a growing conflict with established cable TV systems. Cable operators, while certainly capable of expanding their businesses to include TVRO sales and service, have largely chosen to take an 'adversary position' relative to TVRO, actually 'fighting it' in some communities by pushing for the adoption of zoning regulations which bar or inhibit TVRO use within a town. The 'profile' tells us how the conflict, a natural business competition between two groups, is quickly maturing. For example, 26.5% of all TVRO owners live where they have the ability to plug into a local cable system. Of those 26.5% (or roughly one TVRO owner in four), 48.7% (or roughly one in two) have elected to drop their cable subscription in favor of TVRO. Two smaller groups, those who still subscribe to cable (23%) and those who never subscribed to cable even though it was available to them (24.8%) make up the balance of the 'pie.'

Cable operators are reacting, directly. Cable operator 'trade associations' in Texas, Oklahoma, Arkansas and elsewhere are mounting 'PR campaigns' to attempt to discourage people from buying TVRO. If that seems like a bit of 'overkill' or a 'knee-jerk' reaction to competition, consider this:

A) A cable subscriber, connected to the 'line' and paying his bill each month, has 'value' to the cable operator. Much more value than the $30 to $40 a month he is sending the cable firm. In fact, an active cable subscriber is worth $1,000 to the cable operator!

Cable systems routinely are bought and sold. They have established 'value' based upon something called 'cash-flow,' or the amount of money generated by a subscriber in a set period of time. Through a complicated formula, it turns out that if a cable operator with 1,000 cable subscribers wishes to sell his cable system, he can expect to net $1,000 for *each* cable subscriber. And in our illustration, a 'small' cable system with 1,000 subscribers has a 'street value' of $1,000,000. Who says all of the 'gold' comes from Colombia!

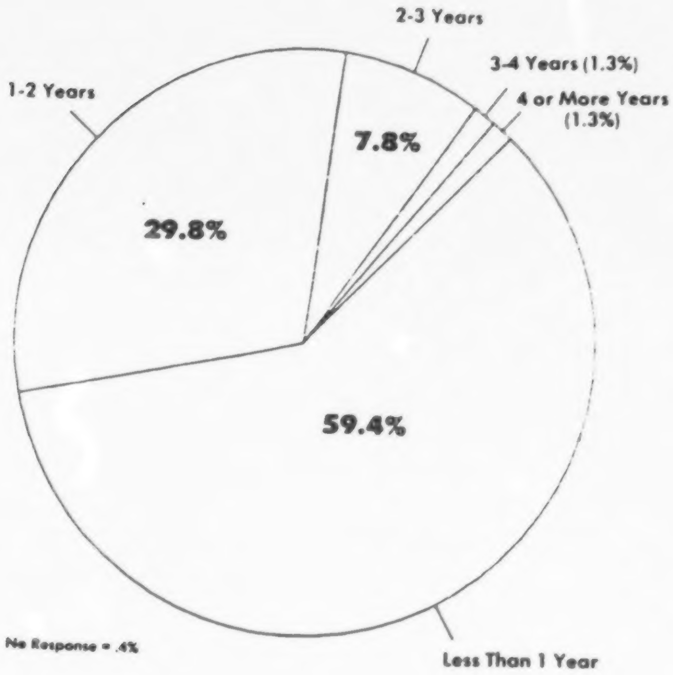
B) So each time a TVRO is sold into a town with cable and the new TVRO owner disconnects from cable, the cable operator just saw his 'net worth' go down by $1,000. It doesn't take very many 'cable dis-connects' caused by TVRO per year, to get the (irate) attention of the cable operator!

The 'profile' shows us how cable's 'monopoly' on entertainment, education and information is being directly threatened by individually owned TVROs. It's not good news for the cable industry.

C) *TVRO Use Perhaps Surprising:* Well over 80% of those participating said they bought their TVRO 'primarily for entertainment' with smaller percentages voting for 'information,' 'education' and business. More than 60% said that 'movies were their primary program choice' followed by sports and then news. A whopping 54.4% reported they had 'tuned-in' HBO 'within 24 hours of filling out the survey' and a larger percentage (81.2%) said they had made use of the HBO service within the last seven days.' Showtime, a stiff competitor of HBO, drew smaller numbers (46.3% within 24 hours, 75.7% within seven days). Some TVRO owners live where they cannot receive *any* terrestrial TV (4.9%). As a sub-group, totally dependent upon satellite TV

Continued on page 12

Continued from page 11



Length Of Ownership Of Satellite Receiving System

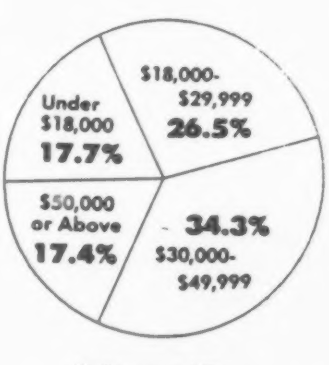
No Response = .4%

for *any* TV, these viewers tuned in CBS satellite feeds as their number one source for news (33.3%) with Atlanta's WTBS (29.4%) ahead of CBS direct-competitors NBC and ABC.

People who must depend upon satellite TV for either their only TV, or for most of their TV (62.5% of all TVRO owners receive four or fewer TV stations 'direct') offer a unique opportunity to measure which of the dozens of American (and Canadian) programming sources are *really* the most appealing. When you take every other program source away, and then provide 100+ channels via satellite where each channel must stand up on its actual programming merits (rather than its ability to be received because of local terrain), an entirely different perspective unravels.

D) ***TVRO Users Are Heavy Viewers:*** According to television broadcast industry statistics, the typical American home has a TV set operating around 36.5 hours per week. TVRO users tend to be heavier users of TV than their antenna/cable connected cousins. 54% reported they use their satellite TV system 'more than 40 hours per week' (setting aside any hours when they use their TV to watch 'normal TV,' assuming that they still do this!) and an enlightened 18.4% average 'more than 59 hours per week.'

E) ***TVRO Users Are Satisfied Viewers:*** Cable industry statistics tell us that while just under 50% of America is hooked up to and paying for cable TV, less than 50% is 'pleased with the cable service.' The cable folks, quick to ridicule TVRO installers and users as a sub-class of humanity, will be surprised to learn that 62.6% of all TVRO owners are 'extremely satisfied' with their TVROs and another 26.6% are 'somewhat satisfied.' A miniscule 5.4% were dissatisfied.



Household Income

No Response = 4.2%

F) ***Most Popular Satellites:*** When your satellite 'dish drive' can take you through more than a dozen separate satellites, each with its own blend of programming, viewer perference for satellites becomes an interesting sidelight of study. The most popular? *Galaxy I*, which 88.1% of those surveyed said they watch 3 or more times per week. Second? *F3R*, attracting 83.8%, three or more occasions per week. And third? *F4*, attracting 54.9% three or more times per week. *Yes*, G-1, F3R and F4 are the most heavily-populated cable-TV 'programming' satellites up there.

G) ***System Costs Vary:*** While there has been a trend, in the retail marketplace, to offer 'low (price) end' systems during the past year, most buyers continue to opt for the middle ground systems that offer far more features (and better pictures). Only 1.9% of the buyers bought a TVRO for under $1,500 while at the opposite end 1.2% paid $7,500 or more. Between $1,501 and $5,000, we find 89.3% of all systems and that fits TVRO dealer statistics which tell us that the 'average retail system' is holding firm at $2,993 nationwide. People in the northeast and southwest are most apt to spend 'bigger bucks' for their TVROs by the way, while people in the midwest are most apt to spend under $1,500.

H) ***Upscale Users:*** If TVRO is a 'fad,' it has good company. The survey revealed that 20.5% of all TVRO owners also own a home computer (far higher than the national average) while 39.5% already own a VCR (although they could have acquired the VCR after the TVRO since the two do go hand in hand). More than 80% have two or more television receivers in the home.

What this massive 150 page tabulation and cross-tabulation of TVRO user demographics and behavioral segmentation profiles tells us is that TVRO is here to stay. It says that the first 1,000,000 TVRO owners have established a diverse base across economic groups (6.1% earn under $12,000 a year; 17.4% earn over $50,000 a year), educational groups (11% had less than a full high school education; 21.6% are college and/or grad school graduates), and occupational groups (9.2% are agricultural; 6.5% are executive). When compared against 'national numbers' unweighted by any special 'interest' groups such as 'TVRO ownership,' the profile says that TVRO people are generally upscale, aggressive, decision makers with a certain leadership role in life. Now, if you fit in these statistics and you don't yet have your own TVRO, time is a-wasting! *A*

WINTEC ELECTRONICS (B)

EXHIBIT II

Article from The Winnipeg Sun
May 16, 1985

Satellite dish industry sees clear skies ahead

THE satellite dish industry in Canada has had it pretty rough lately, representatives say, and they want you to know about it.

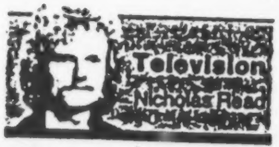
They have also had it up to their antennae with doom and gloom reports about the satellite skies going dark. Such reports have caused a 50 per cent drop in satellite dish sales this spring, say spokesmen for Channel One Video in Vancouver and General Satellite in Montreal, and it's unfair.

The skies are not going dark, they maintain. There may be a few scattered clouds on the horizon, but that's it. Nothing to worry about.

The cause of all this angst are reports that Home Box Office, Cinemax, Showtime, and The Movie Channel, all U.S. cable movie channels, ESPN, the U.S. all-sports channel, and the family-oriented Disney Channel are going to scramble their broadcast signals, thereby making it impossible for satellite dish owners to receive them free-of-charge.

HBO and Cinemax have already begun to scramble their signals; Showtime and The Movie Channel have promised to scramble theirs in early 1986; and ESPN and Disney are expected to follow soon after.

But those six channels, says General Satellite vice-president David Lifshitz, account for only six per cent of the 100-odd channels now available to the average Canadian satellite dish owner.



Michael Price and Robert Barton of Told Canada Sales in Richmond, importers of satellite dish receivers, say even without the premium U.S. movie channels, satellite dish owners have about 3,500 movies a month from which to choose. Most of those movies will have commercial interruptions, they admit, but with that kind of selection, who can complain?

The same is true of sports, says Barton. The Canadian all-sports channel, TSN, has no plans to scramble its signal, and every week dozens of regional stations throughout the U.S. and Canada carry sports broadcasts.

Music video channels MuchMusic and MTV also have no plans to scramble.

There are now about 1 million home satellite dishes — or earth stations, as they are also known — in North America; about 100,000 in Canada. They can cost anywhere from $1,000 to $7,000.

Most, according to industry surveys, are located in rural areas beyond the reach of conventional cable television. But as that market becomes saturated, retailers are hoping to expand to cities.

The main complaints prospective customers have about the system, says Barton, is the size of the dish, which can be up to three metres in diametre, and the limited channel selection. But both concerns are being addressed. The size of dishes is decreasing all the time, he says, and the limited channel selection is just a myth.

He and Price also don't buy the argument that it is unethical to own a satellite dish. According to Canadian Radio-Television and Telecommunications Regulations, Canadians are permitted access to whatever channels are available on their local cable dial, plus three Canadian and six U.S. pay channels. Anything else is considered a pirated, and therefore, forbidden signal.

WINTEC ELECTRONICS (B)

APPENDIX A

How Satellite Television Works

Text adapted from "Tuning Into Home Satellite T.V., 1984, a promotional publication by CommTek Publishing Company, Hailey, Idaho. pp. 1,2,5,6, & 52

Diagram adapted from "Home Satellite T.V." Magazine, September, 1985, p. 15.

How Satellite Television Works

About the Birds

The key to understanding satellite television begins with the satellite. Soon after the U.S.S.R. launched Sputnik I in 1957, the United States countered with Explorer I. However, neither Sputnik nor Explorer was a communications satellite. It was not until July 10, 1962, that the first communications satellite, Telstar I, was launched by the American Telephone and Telegraph Company (AT&T). Telstar I could carry only one television signal or 12 telephone calls at a time.

Today, video satellites that can each carry up to two dozen television channels hover 22,300 miles over the equator in ***geosynchronous orbit*** (they orbit in space at the same speed that the earth turns on its axis, so they always can be found at a specific location in the sky). This band of satellites is called the ***Clarke Belt*** in honor of science fiction writer Arthur C. Clarke, who first proposed in 1945 that satellites could be maintained in space in just such a fashion. Industry spokesmen say the Clarke Belt will be stuffed with satellites by the 21st century.

Besides the North American domestic ***birds*** (slang for satellites), dish owners also can partake of a whole network of international birds (more about this later), with programming from such countries as the U.S.S.R., Mexico and Brazil.

Television satellites vary in design, but they all have the same basic parts. Westar 4, for example, is 7.1 feet wide, 21.6 feet long and weighed 1,280 pounds at the start of its orbital life (300 hundred pounds of propellant will be consumed during Westar 4's 10-year life span). It contains control and propulsion systems that can be manipulated from earth should it stray from its orbit, and is equipped with solar panels that produce 935 watts of electrical power to operate all its systems.

But what makes Westar 4 a boon to television viewers are its 24 ***transponders***, or relay systems, which are similar to the channels on your television set. (Some of the first birds, however, only have 12 transponders.)

Each transponder carries up to 2,400 one-way voice circuits or one color television program. Broadcast companies such as Home Box Office or the major television networks lease a transponder from the satellite owner—for example, RCA and Western Union own the Satcom and Westar series, respectively, while Anik birds are the property of the Canadian government—to service each affiliate station or subscribing cable system simultaneously by blanketing the nation with a signal.

Without satellites, television programmers would have to be connected with each affiliate on separate earthbound microwave systems at a staggering expense.

With a dish, you bypass this network of middlemen so that you can choose from *all* the satellite programming available—more than 100 services—whereas cable subscribers usually only can choose from about 20 services. And except for subscription fees for scrambled services, dish owners pay no monthly charges to see what's on the satellites.

Getting the Signal

The pieces of equipment you use to pull down the signal are few. Besides the 6- to 20-foot dish, there are the ***low-noise amplifier*** (LNA) and ***feedhorn*** assembly, ***downconverter*** and ***satellite receiver***. Your cup-shaped dish is made of highly reflective materials to gather and focus the signal to the feedhorn at the center of the dish, where it is amplified by the LNA.

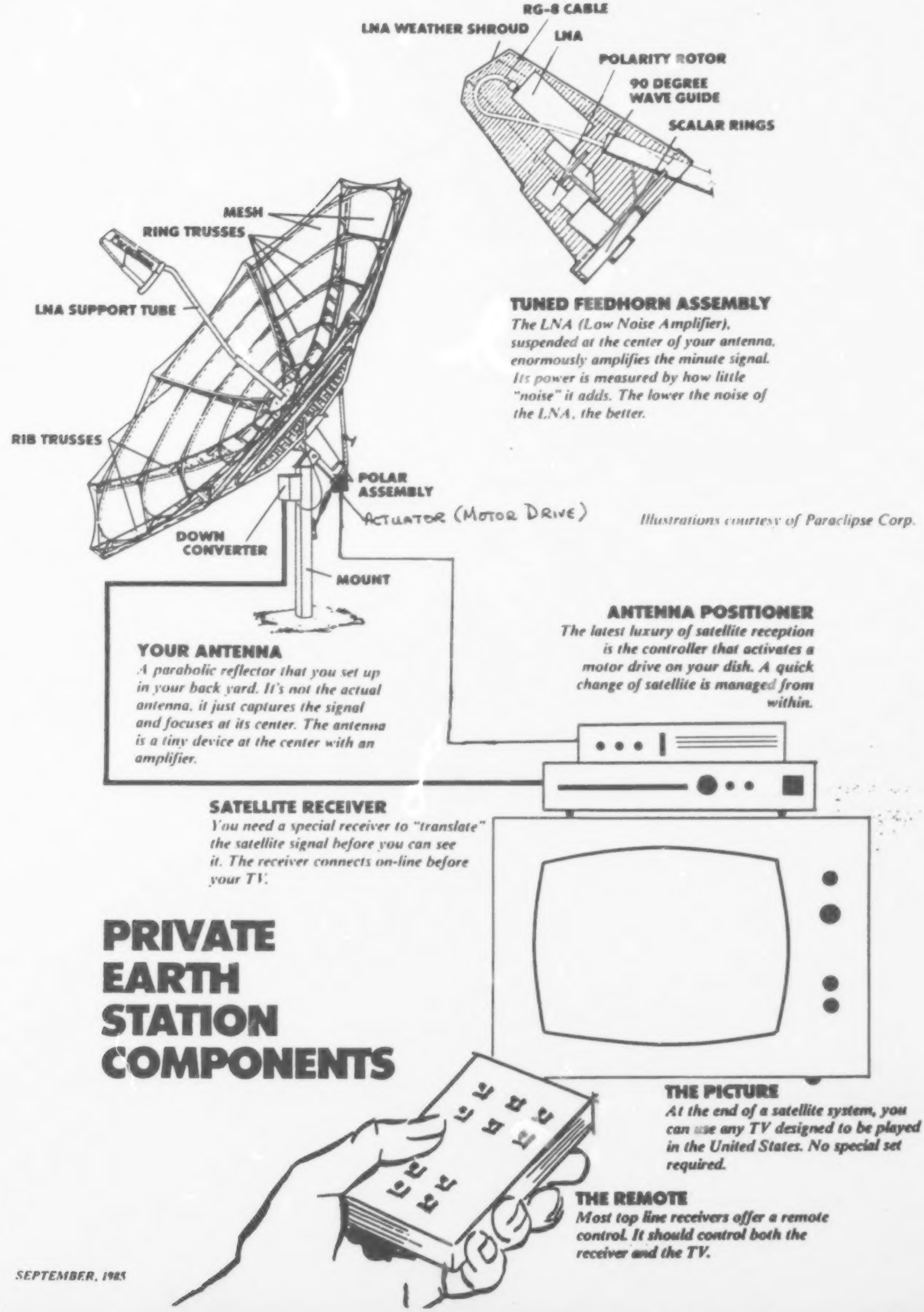
The signal is then channeled to the downconverter, where its frequency is lowered and passed on to the receiver. A satellite receiver resembles a television receiver and performs many of the same functions.

To pluck a program from the sky, you begin at the receiver, which is your control center. It is difficult to discuss receivers in general because there are many models with many different functions, but there are basic functions performed by all. The receiver provides you with the controls you need to operate your equipment, besides further altering the signal to make it acceptable to your television.

The satellites orbit 3 to 4 degrees apart and their positions relative to the earth are indicated by degrees as well. (Galaxy 1, for example, is located at 134 degrees west.) If your dish is equipped with an **actuator**, or motorized drive, it will automatically move across the Clarke Belt and a signal-strength gauge on the receiver will tell you when you're getting close to the desired bird.

After locating your bird, you will need to find the specific transponder that has the show you want to watch. To do this you must understand the difference between vertical and horizontal transmissions. Two adjacent signals can be projected from transponders on overlapping frequencies without interfering with one another if one is broadcast on a vertical plane and the other on a horizontal plane. This method of overlapping to double signal capacity is called ***polarization.*** This is why recent satellites carry 24 transponders instead of 12. So when you open the pages of a publication such as *Satellite ORBIT* magazine—which shows how to locate all the satellites, besides providing complete program information—you can find out whether your program is on a vertical or horizontal plane, and adjust your receiver accordingly.

So, in order to watch satellite television, you will need: a satellite dish, a low-noise amplifier (LNA), a downconverter and a satellite receiver. Depending on where you live and the features of the equipment you purchase, a complete system will cost you from $2,000 to $5,000. Your dealer may be able to offer you financing, and some dealers even offer dishes on a rental basis.


RG-8 CABLE
LNA WEATHER SHROUD
LNA
POLARITY ROTOR
90 DEGREE WAVE GUIDE
SCALAR RINGS
MESH
RING TRUSSES
LNA SUPPORT TUBE
RIB TRUSSES
POLAR ASSEMBLY
ACTUATOR (MOTOR DRIVE)
DOWN CONVERTER
MOUNT

PRIVATE EARTH STATION COMPONENTS

TUNED FEEDHORN ASSEMBLY
The LNA (Low Noise Amplifier), suspended at the center of your antenna, enormously amplifies the minute signal. Its power is measured by how little "noise" it adds. The lower the noise of the LNA, the better.

Illustrations courtesy of Paraclipse Corp.

YOUR ANTENNA
A parabolic reflector that you set up in your back yard. It's not the actual antenna, it just captures the signal and focuses at its center. The antenna is a tiny device at the center with an amplifier.

ANTENNA POSITIONER
The latest luxury of satellite reception is the controller that activates a motor drive on your dish. A quick change of satellite is managed from within.

SATELLITE RECEIVER
You need a special receiver to "translate" the satellite signal before you can see it. The receiver connects on-line before your TV.

THE PICTURE
At the end of a satellite system, you can use any TV designed to be played in the United States. No special set required.

THE REMOTE
Most top line receivers offer a remote control. It should control both the receiver and the TV.

Watchwords

Common Satellite Television Terms

Actuator—A motor that turns the dish to tune in on a satellite.

Bird—Another name for a satellite.

Clarke Belt—The band of satellites that hovers over the equator in geosynchronous orbit, named in honor of science fiction writer Arthur C. Clarke (see "geosynchronous orbit").

Decoder—A box that allows a satellite signal to be "descrambled" (see "scrambling").

Dielectric insert—A device that allows a dish owner to view international satellites with a compatible satellite receiver (see "satellite receiver").

Dish—A parabolic-shaped reflector that directs satellite signals to the feedhorn (see "feedhorn").

Downconverter—A piece of equipment that lowers the frequency of a satellite signal so it can be viewed on a television.

Downlink—The signal that comes down from a satellite to a dish.

Feed—A program that is broadcast via satellite before it is edited.

Feedhorn—The device on a dish that directs satellite signals to the low-noise amplifier (see "LNA").

Footprint—The pattern of signal strength of a satellite's transmission as it strikes the earth.

Geosynchronous orbit—The orbit of a satellite 22,300 miles above the equator. In such an orbit, a satellite will circle the Earth at the same relative speed as the Earth's rotation, causing the satellite to remain fixed in relation to a specific point on Earth.

LNA (low-noise amplifier)—A special amplifier that boosts the strength of a satellite signal without contributing "noise," or interference.

Polarization—A process that allows two overlapping kinds of signals—horizontal and vertical—to be broadcast simultaneously from the satellite so that the number of transponders available for viewing is doubled (see "transponder").

Satellite receiver—A receiver that is similar to the receiver in a normal television, but which also allows a dish owner to receive satellite signals.

Scrambling—A method used by satellite television programmers to garble their signals so they can't be received by viewers without decoders (see "decoder").

Subcarrier—A part of a satellite signal bandwidth that is not used for video transmission, and therefore can be used for audio and other types of services.

Superstation—Originally a local, independent television station that gained a large, nationwide audience when it began transmitting via satellite.

Transponder—A microwave repeater in the satellite that amplifies and changes the frequency of a received band of signals from Earth. North American satellites have either 12 or 24 transponder "channels."

Uplink—A communications system consisting of an earthbound transmitter, the receiver portion of the transponder and the space through which a signal passes.

TEACHING NOTE & PRACTITIONER GUIDE

WINTEC ELECTRONICS (B)

WINTEC ELECTRONICS (B)

Teaching Note and Practitioner Guide

Synopsis

The case describes an industrial electronic manufacturing firm which also produces a dish positioner for home satellite dishes. The product is marketed through another firm in the satellite equipment business. In order to remain price competitive in the marketplace while maintaining profit margins, Wintec must increase and automate production to achieve cost economies. Management is not sure whether or not this rapidly growing consumer market is appropriate for Wintec and must appraise the size of the opportunity and the risks involved in expansion.

The case includes information on (1) the company background in brief [further background must be obtained from Wintec Electronics -(A) case]; (2) the development of the dish positioner and the operation of satellite dishes; (3) the market for dish systems, including Wintec's positioner; (4) potential legal and technical developments which may affect the market; and (5) estimated expansion costs.

Teaching Objectives

1. To illustrate the problems and opportunities associated with an industrial firm entering rapidly expanding, highly technical consumer product markets.

2. To explore the subject of company/product "fit", and the issues of product line diversity and the product life cycle.

3. To illustrate the effects of derived demand on an industrial marketer.

4. To illustrate the kinds of analysis required in analyzing corporate expansion alternatives.

Teaching Suggestions

1. This case can be used as a follow-on case to Wintec Electronics (A) or it can be used as a "stand-alone" case with the instructor providing some of the more detailed company background from the (A) case.

2. A question concerning the overall potential of the dish market might provoke some discussion. It is a relatively hot topic, and students may have

their own opinions. The instructor may also wish to elicit a preliminary opinion from the class on the question: should Mr. Williams "go" (expand production and move into the market heavily) or "no go" (bow out of this market and look for new opportunities)?

3. The discussion can then move specifically to an assessment of the market for Wintec's product, resulting in an estimate of the opportunity.

4. What about risks? The instructor may wish to begin developing a list of pros and cons for the "go/no go" decision, and discussing qualitative factors, as well as estimating breakeven quantities and timing on the new expansion. How probable is it that Wintec, through SatScan, can achieve these volumes in the necessary time frame?

5. At this point the instructor could ask if there is any consensus on the expansion opportunity. Does it differ from the original opinions expressed? Discussion should involve the issue of how appropriate this product and market are for this company. Is there a "fit", and how can Mr. Williams handle the change in company emphasis and product line diversity under either decision?

Specific Questions

1. What is the market potential for Wintec's satellite dish component product? How big is the opportunity?

2. What are the pros & cons of Wintec producing an integrated receiver/positioner unit from Wintec's viewpoint, from SatScan's viewpoint, and from the ultimate consumers viewpoint?

3. How much control does Wintec have over marketing this product?

4. What profits can the company expect, and how long will it take to breakeven on the expansion?

5. How big is the risk involved to Wintec?

Analysis

1. What is the market potential for Wintec? How big is the opportunity?

   The North American Market is 500,000 to 1,000,000 units. Use a conservative estimate of 500,000. As SatScan is not marketing much in the U.S., only the Canadian portion is relevant; about 10% of the total.

500,000 x .10 = 50,000 units/year in Canada. Thus, Wintec's current sales of 5000 units/yr. represent 10% of the Canadian market.

Assume a 20% market growth rate, and that 60% of industry sales are low-end units (because 60% of Wintec's sales are low-end). The resulting market potentials are:

1985 50,000 units x .6 = 30,000 units
1986 60,000 units x .6 = 36,000 units
1987 72,000 units x .6 = 43,200 units
1988 86,400 units x .6 = 51,840 units
1989 103,680 units x .6 - 62,208 units
1990 124,416 units x .6 = 74,650 units

Mr. Williams's desired volume of 25,000 units presently represents half of the total Canadian market, or 83% of the low-end units sold in Canada. In five years time, that volume will be 20% of the Canadian market or 34% of the low-end group.

These numbers can be adjusted by whatever assumptions the student feels are reasonable about the probability of the large competitors dropping prices even further, and/or the likelihood that integrated receiver/ positioner units will increase in popularity. Is it likely that less than 60% of buyers will be interested in separate (non-integrated) control units in five years time?

2. What are the pros and cons of Wintec producing an integrated receiver/ positioner unit -- for Wintec, for SatScan, and for the consumer?

For the consumer:

Pro - the combined unit is much more convenient -- only one box instead of two on top of the T.V. and only one set of controls to fiddle with.
- eventually, as the technology improves, a combined unit may be cheaper than a separate receiver and positioner.

Con - Initially, the integrated units are very expensive.

For SatScan:

Pro - If the trend really is towards consolidating components, an integrated unit would be a more attractive product to market. Due to the advantages of integration for the consumer, a higher markup might be possible.

Con - The integrated units thus far appear to be selling at the more expensive end of the product line; this is an area where SatScan has little or no expertise.

For Wintec:

Pro - Production of such a unit might enable Wintec to get in on the ground floor before integrated receiver/positioners become the wave of the future. If the price can be kept down these units might sell as part of a medium-priced system, thus expanding the market possibilities. Profit margin would be greater on a combined unit.

Con - Wintec does not have the staff or financial resources to invest in receiver technology, a completely different field from present projects. This technology also changes very rapidly and it could be difficult for Wintec to remain competitive with the very large U.S. manufacturers presently in the field. Purchasing receivers would help with this problem, but Wintec would still have to keep up with the technology in order to successfully integrate the two components. The concept of the product life cycle is relevant to a discussion of barriers faced by Wintec. Is it reasonable to expect a small Winnipeg based firm with limited financial and human resources and with locational disadvantages to keep pace as dishes and dish positioners move through their industry and product life cycles? Can Wintec cope with product life cycle dynamics?

3. How much control does Wintec have over marketing this product?

At the present time, all marketing is done through SatScan and Wintec must rely on SatScan's efforts to increase its sales. SatScan is apparently reasonably effective in Canada, as they appear to have captured 10% of the Canadian market. Mr. Williams feels that SatScan does an effective promotion job. SatScan is considering going direct to dealers and apparently has the resources to do so. Selling direct may increase sales and also, by cutting out the distributors' margin, may slightly ease the price pressure felt by SatScan. However, a small sales force such as that run by SatScan is unlikely to suddenly make major inroads into the U.S. market, so expansion possibilities may be limited.

It appears that the dish controller marketing job is handled adequately at this time, but Wintec has no control over it. If he wishes to increase his control, Mr. Williams could take one or more steps, for example:

-begin direct advertising of his own product to the trade and/or end user;

-look for alternate or additional purchasers other than SatScan, so that the product was marketed under several different brand names;

-also go directly himself to dealers or distributors to sell the product.

Any of these moves would increase his market coverage and perhaps his market share. However, Wintec has no marketing department and Mr. Williams has limited experience in this area. As well, he has limited resources.

4. What profits can the company expect, and how long will it take to break even on the expansion?

a) Contribution Margin:

low-end unit price.............. $100 x 60% = $60
medium price................... $150 x 40% = $60
Thus, average unit price........ = $120
x 30% contribution margin....... = $36
Therefore Contribution per unit is $36.

b) Fixed Costs of Expansion:

equipment...............	$200,000
additional space........	$ 30,000
additional staff (20 x $15,000)..........	$300,000
Total	$530,000

c) Break Even in Units:

$\frac{\$530,000}{\$36}$ = 14,722 units more than present volume of 5,000
Total = 19,722 units or $\frac{19,722}{50,000}$ = 39.4 % share of 1985 Canadian market.

NOTE: The staff and space costs will be annual. Therefore to break it out:

$\frac{\$200,000}{\$36}$ = 5, 556 units to break even on equipment investment.

$\frac{\$330,000}{\$36}$ = 9176 units per year more to break even on increased annual costs.

Alternately, the equipment cost could be amortized over a 5 year period, at $200,000 divided by 5, or $40,000/year. Therefore, the revised total annual fixed costs are:

$$\$300,000 + \$40,000 = \$370,000$$

$\frac{\$370,000}{\$36}$ = 10,278 units/year more to break even on new costs, or a total volume of 15,278 units/year.

d) $\frac{15,278}{50,000}$ represents 30.6% of the Canadian market in 1985.

Using the figures for the Canadian Market given in #1, and the required break even of 15,278 total units/year, we can assess profits at different market shares over the five year period.

			Market Shares	
Year		10%	20%	30%
1985	Units	5,000	10,000	15,000
	$ Profit (loss)	($370,000)	($190,000)	($10,008)
1986		6,000	12,000	18,000
		($334,008)	($118,008)	$97,992
1987		7,200	14,400	21,600
		($290,808)	($31,608)	$227,592
1988		9,640	17,280	25,920
		($202,968)	$72,072	$383,112
1989		10,368	20,736	31,104
		($176,760)	$196,448	$569,736
1990		12,442	24,883	37,325
		($102,096)	$345,780	$793,692

Obviously, either a very large market share or a substantial increase in market size are necessary to make this a profitable undertaking. Students should be "pushed" to evaluate the likelihood of either or both of these outcomes occuring.

5. How big is the risk involved to Wintec?

As the preceeding calculations demonstrate, given the current assumptions about market size and the lack of access to the larger U.S. market, Wintec stands to lose anywhere from $100,000 to $400,000 unless it can achieve over 30% market share. This is a very large risk to take on a venture over which the firm has no marketing control.

In addition, there is risk associated with the uncertainty of this market -- does Wintec's product fit with what the marketplace will want in the future? How reliable is the marketing information and expertise of SatScan? Can Mr. Williams risk his company on the basis of SatScan's past performance, and would the potential rewards be worth that risk?

Another important issue is that of the nature of the company. Wintec presently maintains a product line mix of three different areas, and Mr. Williams is already concerned that the company is excessively dependent on a limited number of customers. If he proceeds with the expansion and it is successful, Wintec's business will become 75% satellite equipment and the rest of the products will be secondary. Is this the business balance Mr. Williams wants? Is the opportunity great enough to transform his company from an industrial electronics R & D and manufacturing firm to a satellite systems electronics manufacturing firm? What kind of R & D policies would he maintain under such a change?

6. Concluding Comments.

Wintec faces derived demand. The sales of its controller depend on the ultimate consumers adoption rate for satellite dishes. It is very difficult for a small component manufacturer to influence ultimate consumer demand. The product life cycle also affects Wintec's success. Many consumer electronics markets move from introduction to rapid growth, competitive turbulence, maturity and decline. The time duration of each stage is unpredictable as is the rate of increase or decrease in total product category sales. Are satellite dishes a fad? Will a new technology eliminate their need? Can Wintec realistically expect to be a competitive component supplier in the face of downward price pressures as the dish product moves through the growth and mature stages of its product life cycle?

Many small, high-technology component manufacturers face the same issues as illustrated in the present case. To survive, these firms must have a clear definition of their business mission and objectives as well as a reasonably formal and disciplined process for screening and evaluating the products and clients to whom they "hitch their cart." Selecting poor products or incompetent clients (marketers) could spell disaster.

In the face of the many uncontrollable factors, small component manufacturing firms may be well advised to spread the risks across several products/clients. Wintec has a reasonable balance in its product/market portfolio, but it and other firms like it may be well advised to broaden the base.

GENERAL PRINCIPLES {MESSAGES} TO BE LEARNED BY SMALL, TECHNOLOGICAL NEW PRODUCT FIRMS

Based on the situation presented in the case and on the issues raised in the analysis, the following generalizations can be made:

1. THE "FIT" BETWEEN THE COMPANY AND THE NEW PRODUCT OPPORTUNITY MUST BE CAREFULLY ASSESSED.

There is a good "fit" between Wintec's technical competences and the dish positioner product. Wintec has been very successful in developing technical, electronic products under agreement or contract with client firms. However, changes in the marketplace have called into question Wintec's ability to survive and prosper with the dish positioner product. There is a rapid rate of technological change. Can Wintec afford to invest in the R & D necessary to keep up with competitors product improvements? Perhaps the technical and financial resource capability of Wintec do not "fit" the emerging market requirements! Wintec's president recognizes that his firm has no marketing expertise. Therefore, there is a poor fit between Wintec and the marketing resources and skills required to be successful in the dish positioner business. A firm should choose areas of opportunity where there is a "fit" with its resources and competences. Also the firm must watch for changes in technical and market situations which can lead to a "poor fit".

2. STAGES IN THE PRODUCT AND MARKET LIFE CYCLE MUST BE UNDERSTOOD AND ANTICIPATED.

Satellite dishes, and the associated component parts such as dish positioners, are in the GROWTH stage of the life cycle. New products, technologies and markets tend to move through four stages over time: INTRODUCTION, GROWTH, MATURITY and DECLINE. These stages are indicated on the figure below:

$
Sales

-- Time
Intro-duction Growth Maturity Decline

During rapid GROWTH many competitors tend to enter the lucrative market. As more competitors appear and as the market moves towards MATURITY the market enters a "competitive turbulence" stage where firms fight to differentiate their product from others. Also, there tends to be a price competition as well as a fight to see who can stay at the forefront of technology. Some firms rapidly die or exit from the market because they do not have the resources and skills to compete. Wintec is facing a market with declining prices, rapidly changing technology and competitive turbulence. For a small firm, with limited resources and little marketing expertise, it might not be wise to try to defend or boost its market share. Perhaps, it should stay in the market as long as its product is making an acceptable profit and then exit. Many small firms can survive rapid GROWTH markets but cannot compete when competition, price and technology battles heat up.

3. THE CONCEPT OF DERIVED DEMAND MUST BE UNDERSTOOD.

Wintec will only sell its dish positioner component if its client and other competitors are successful in selling satellite dish control systems. In turn, the dish control systems will only be demanded if consumers buy the satellite dishes themselves. It can be said that Wintec's demand is derived from (or dependent upon) the demand for satellite control systems which, in turn, are in a derived demand situation with respect to the dishes themselves. All component supplies and indeed most industrial marketers face a derived demand situation. Firms such as Wintec, therefore, must monitor and analyze the market and competitive situations affecting their clients' products. Wintec seems to have done a reasonably good job of this.

4. MARKETS AND COMPETITION MUST BE ANALYZED.

Wintec seems to have a reasonably good feel for the changing market and competitive forces in the ultimate (derived demand) market for its product. Other small, technically oriented firms would do well to emulate Wintec in terms of keeping abreast of changing market conditions.

5. BUYER BEHAVIOR MUST BE UNDERSTOOD.

Consumer preferences for satellite dish receivers/positioners appear to be changing. They seem to prefer integrated, all-in-one, receiver/positioner units. If these preferences are strong and continue into the future, Wintec's product will become outdated. All firms must satisfy consumer needs and desires. Unfortunately, these preferences change over time and must be monitored through marketing research, and products and marketing approaches must be changed. Few small firms can keep pace with mass consumer markets. It is usually advisable for the small firm to choose a segment or "NICHE" in the larger market and not try to compete with the larger, more experienced and well financed mass producers.

6. FINANCIAL FEASIBILITY ANALYSIS MUST BE PERFORMED.

The financial calculations presented in the analysis to this case provide an important input to Wintec's decision about which option it should act on.

7. CHANGES IN THE LEGAL ENVIRONMENT MUST BE ANTICIPATED AND ANALYZED.

This Wintec case provides a good example of how regulatory/legal forces can influence product and market sales. At the time of the case many jurisdictions were grappling with thorny legal and "rights" issues surrounding use of satellite dish equipment. It is possible that laws could be passed that would substantially reduce the demand for satellite dishes in their present form. All firms must be aware of legal and political influences.

8. EACH FIRM MUST HAVE A PORTFOLIO OR MIX OF PRODUCTS AND MARKETS.

Wintec is vulnerable since 30% of its sales are in the satellite dish business. If it has to abandon this product/market it will suffer sharp drops in profitability and may have to reduce staff. Firms can spread the risks by developing a mix or portfolio of products which are in different markets and where no one product or market accounts for too large a share of overall company sales and profits. Wintec is perhaps better than most small firms in that it has at least three major product/market areas. However, as the case and analysis points out, Wintec is still vulnerable. The old phrase, "don't put too many of your eggs in one basket," is applicable to small firms. Unfortunately, many small companies do not seek diversification until they are forced to.

Volume

3

THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA

A Series of case studies

Vol. 3 Worker Adjustment

(managerial dilemmas
staff relations
changing job functions)

Manitoba
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TABLE OF CONTENTS

Foreword 2

1 Introduction 5

2 Canadian Agricultural Services Limited 7

The Case Study 8

Appendices 12

Teaching Note and Practitioner Guide 16

3 Prairie Grain Producers 20

The Case Study 21

Exhibits 29

Teaching Note and Practitioner Guide 33

FOREWORD

ABOUT THE SERIES

Technological change is effecting the Manitoba business community in ways only dreamed of less than a generation ago. New, modern, technological innovations are being introduced at unprecedented rates. Increasingly, continuing entrepreneurial competitiveness seems dependent on the ability and willingness of individual businesses to identify and capitalize on technological innovations, and to adapt work methods, procedures, and operations to such innovations.

Recognizing the positive challenges inherent in identifying and assimilating technology into general use, the Technology Division of the Department of Industry, Trade and Technology, and the University of Manitoba, through the Faculty of Administrative Studies, cooperatively developed a series of Manitoba-based case studies addressing the management of technological change. The purpose for this joint venture was to foster awareness of technological innovations among business practitioners and business students, as well as to assist organizations manage technological change.

The series titled "THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA" comprises four volumes:

Vol. 1, Financing Entrepreneurial Ventures (stages, uses, & sources)

Cases: ABI Biotechnology Inc.
- financial crisis in raising development funding
- early stages of technological entrepreneurial ventures

Homestead Computer Services Ltd.
- strategies for long-term company growth: market development, new product selection
- financing long-term company growth

Vol. 2, Marketing Technological Products (processes, issues, & problems)

Cases: Sota Electronics Corporation
- developing a new technological product
- marketing a new technological product

Wintec Electronic (A)
- developing a new technological product
- reviewing R & D priorities
- marketing strategy

Wintec Electronic (B)
- production automation: analysis of marketing potential, cost effectiveness and expansion alternatives

Vol. 3, Worker Adjustment (managerial dilemmas, staff relations, and changing job functions)
Cases: Canadian Agricultural Services Limited
- impact of automation on staff relations
- impact of automation on job functions

Prairie Grain Producers
- managerial dilemmas and automation: fundamental problems and their effects on organizations from managerial perspective

Vol. 4, Automation: Robotics and Office Information Systems
Cases: Versatile Farm Equipment Company CAD/CAM System
- remaining competitive through automation
- acquiring a CAD/CAM system: factor and strategic analyses

Mid-West Garments Apparel Corporation
- reasons and conditions for considering new technologies
- importance of open-minded corporate attitudes

Quality Electrical Fixtures & Supplies Inc.
- management issues re: making effective use of information technology

The Technology Division had an editorial function in preparing these volumes

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ABOUT THE CASE STUDY METHOD

A case study is a sample of a real life situation; in this instance, a real life business situation. As a method of learning and teaching, the case study affords a unique opportunity for technological entrepreneurs, business practitioners, and business students to develop a better, perhaps fuller, understanding of a business situation which is of immediate or long-term concern to them. Through case study analysis and debate, as well as exposure to the experience and opinions of other entrepreneurs, practitioners, and students, participants learn several ways of looking at, thinking about and acting in a particular business situation. Hence, through indepth examination and diagnosis of situations comparable to their own, improved guides to action may be developed. (Reference: International Labour Office. (1972). An Introductory Course in Teaching and Training Methods for Management Development. Geneva: ILO Publications).

ABOUT THIS VOLUME

This volume comprises two case studies -- Canadian Agricultural Services Limited, and Prairie Grain Producers. Taken together, these two cases can be used to illustrate the effect that automation can have on interdepartmental relationships and to show some of the dilemmas that managers face during automation.

The volume is primarily meant for two audiences, as follows:

1. Middle managers seeking solutions to some of the managerial problems that arise with the introduction of new technology in the workplace. Such managers maybe associated with large companies or small ones.

2. Business students who are in the process of learning about the human dimension of technological change in the workplace.

The volume is intended for use in a variety of settings. For example, a business entrepreneur, together with other key members in his/her organization, may elect to review the case studies as part of their interdepartmental consultation process regarding the introduction of new technology into the workplace. Middle managers could also use the volume to learn about the type of adjustments that managers from other organizations had to make with computerization. Similarly, business educators could use the case studies to stimulate the thinking of their students.

ABOUT THE ORGANIZATION OF THIS VOLUME

This volume is organized into three major sections. Section 1 introduces the learning objectives. Section 2 presents the Canadian Agricultural Services Limited case study in its entirety; Section 3 similarly presents the Prairie Grain Producers case study. Each section is further divided into two parts: the case study itself including exhibits and/or appendices, and the teaching note and practitioner guide.

Section 1

INTRODUCTION TO
VOLUME 3: WORKER ADJUSTMENT

INTRODUCTION

Volume 3 is made up of two case studies -- Canadian Agricultural Services Limited and Prairie Grain Producers. Taken together, these two studies can be used to illustrate some of the fundamental management difficulties that organizations can face when attempting to introduce new technologies into the workplace. Canadian Agricultural Services Limited describes the conflicts that arose between head office staff and line personnel in the field when a distributed computer system was introduced. The study makes mention of the broader questions arising in many industries today concerning the way in which distributed computer systems are altering the positions of middle managers. Prairie Grain Producers, from the perspective of the Manager of the Computer Programming Department, describes some of the basic management problems encountered when this agricultural cooperative began computerizing its accounting, sales and marketing activities.

Objectives

As a package, these case studies can be used to meet the following objectives:

1. To illustrate some of the fundamental management problems involved in computerizing accounting, sales and marketing activities.

2. To illustrate that increasingly, many organizations will be addresssing issues related to the tighter controls associated with computerized efficiency and the flexibility connected with individual initiative and responsibility.

3. To explore the types of ongoing consultation processes that should be held during the introduction of new technologies.

4. To illustrate ways in which computerization may change the functions of middle management.

5. To explore the types of structures that can help ensure effective implementation of advanced computer information systems.

Section 2

CASE STUDY:

CANADIAN AGRICULTURAL SERVICES LIMITED

CANADIAN AGRICULTURAL SERVICES LIMITED[1]

Here's the computer," said Bill Reinfeld, gesturing without much enthusiasm, "we've had it for almost a year now." Bill was referring to the mini-computer installed in the Canadian Agricultural Services Limited elevator in Maltby, Manitoba, which he has managed since it was built five years ago in 1980. Over half of the Canadian Agricultural Services' 160 country elevators were now on line to the Winnipeg head office and Bill's elevator, as one of the most modern in the firm, was an early target for computerization.[2] Bill, however, remained ambivalent. "Next month I meet my area manager and the data processing manager to discuss how the system has operated over the past year. What am I supposed to say?"

Slows Down Service

Bill got right to the point. "Frankly, the prime purpose of my job is public relations -- to bring business in. The bottom line is to get business in the door. This means good service to the farmers." For Bill, service meant a number of related activities: acting as agent for the Canadian Wheat Board, marketing non-Board grains and special crops, selling farm supplies, and acting as an information channel between his company and local producers.[3] Computerization had so far done little to make his job any easier. In fact, it had made it more difficult.

"Computerization has standardized procedures for purchasing grain and selling farm supplies throughout the company. Now all elevators do their operations the same way. This has cut down my freedom of action. I used to have my own way of writing a split cash ticket.[4] Now I have to do it the company's way. All this slows down my ability to give the farmer-clients the kind of service I think they should have."

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[1] This case was prepared by Professor Joel Novek of the Sociology Department, University of Winnipeg as a basis for classroom discussion rather than to illustrate either effective or ineffective handling of an administrative situation. This material is the property of The Technology Division, Manitoba Department of Industry, Trade, and Technology.

[2] Appendices A, B, and C outline the goals of the Canadian Agricultural Services Limited in computerizing its country elevators.

[3] These themes are also developed in Appendix C.

[4] This refers to a payment for a load of grain made out to two or more individuals.

While Bill saw computerization as slowing down service in the elevator, he saw it as speeding up communications with the Winnipeg head office. "This is more efficient for the company as a whole and especially for the head office," he explained. "Before computerization it took the company about seven days to get their money back when they bought grain from a farmer. Now it takes only one day. I used to mail receipts on cash tickets issued to farmers to head office. Then they would be couriered over to the Wheat Board and the company would get paid. Now, every purchase I make is recorded in the company's mainframe and sent on to the Wheat Board. The company is reimbursed in a day instead of seven and saves a bundle on interest."

More rapid and standardized communications with head office had also meant much closer monitoring of the elevator manager's performance. Paperwork and accounting from country elevators was sent on electronically to Winnipeg where, with the standardized procedures, management could keep track of it. The monitoring did not stop there. Electronic information on grain purchases and shipments was sent on to the Wheat Board and Canadian Grain Commission who did their own monitoring. Bill commented, "Right now we have to keep on top of everything at the elevator."

Bill insisted that it was not the monitoring itself that bothered him. "Head office can monitor me all they like. I've got nothing to fear. After all, my grain shipments and farm supply sales are there for all to see and I meet or exceed budget every year." What bothered him was the feeling that all the emphasis on standardizing procedures impeded his service to the farmers.

This view was reiterated by Bill's secretary, Alice McManus, who performed most of the actual data entry work. Although Bill had taken the company's course on computers for elevator managers, he seemed content to let Alice be the operator. For her part, Alice insisted that the computer did get in the way of service to farmers because it was faster to make out cash tickets by hand.

"Now," said Alice, "in order to make out a cash ticket I have to identify the producer by I.D. number and enter twenty different procedures before the ticket can be issued. This slows everything down and makes it more impersonal. Besides, if the computer is down, there's no ticket."

As if to illustrate this very point, later that afternoon the computer screen went blank. Bill entered the office with a farmer who had just delivered a load of flax. Glancing at the screen he deadpanned: "Look's like the bank's closed. Come back tomorrow for your cheque." He explained that when the system was down the elevator would still accept delivery of grain but the farmer could not be paid until it was running again. That way the company did not really lose but it was more difficult for Bill to deal directly with farmers. Bill explained, "After all, nobody likes to deliver something without getting paid for it right away."

The Elevator Manager's Outlook

Bill's problem with the computer was not based on opposition to technological change per se. He was a relatively young elevator manager in his thirties, a university graduate and proud of the modern plant and advanced grain handling equipment he operated. Nor did he believe that the company had failed to consult him on the introduction of computer technology. He has no complaints about the level of consultation with elevator managers, the training he was given in computer operations, or the special instruction he received when the computer was actually installed.

In fact, Bill stressed the openness of communications within the company. The upcoming meeting with the area and data processing managers to discuss the computerization program would be one of a number held on this issue. Bill was ready to put forward his own point of view as he had done on previous occasions.

Bill's dissatisfaction stemmed more from his close identification with the goals of Canadian Agricultural Services Limited than a rejection of them. He strongly approved of his company's competitive marketing approach. He described himself as business-minded, bottom-line-oriented, and anxious to increase his elevator's market share in a competitive environment. He liked the independence, the sense of responsibility and the business-minded attitude which, he said, the company cultivated in its elevator managers.

In order to become an elevator manager, Bill had served an apprenticeship in another elevator where he learned grading and purchasing grain, dispatching rail cars and selling farm supplies. This traditional "hands on" instruction was supplemented by more formal courses in such areas as customer relations, credit and management skills. The breadth of this training combined with the flexibility of his work role and geographic isolation from head office imbued him with an independent outlook at odds with bureaucratic procedures and standardized controls. This outlook was reinforced by his own forceful personality. He remained convinced that Canadian Agricultural Services Limited still offered its elevator managers more autonomy in marketing grain and setting farm supply prices than any of its competitors.

The computer, however, was the most visible and obvious symbol of head office intrusion which threatened the autonomy he so valued at Canadian Agricultural Services. In his own words, "I have to know how to bring business in the door, how to operate the elevator, and how to manage people. Computerization has standardized procedures, reduced my freedom, and slowed down my service to the farmer." Bill's response was to avoid operating the computer whenever possible and to complain about it when given the opportunity.

Bill was a smart enough manager to realize that the computer network maximized efficiency from the point of view of head office. The problem occurred whenever head office efficiency conflicted with his own. He knew that the channels of communication at Canadian Agricultural Services were sufficiently open to allow him to communicate his feelings to his superiors.

The meeting next month would afford him just such an opportunity. The question remained: would anything come of it?

Questions for Discussion

1. For what purposes has the computer system at Canadian Agricultural Services been implemented?
2. How has the computer system altered procedures in the elevator?
3. What are the major sources of Bill Reinfeld's dissatisfaction with the way the computer system operates? Do you believe his concerns are justified?
4. What position should Bill take at the upcoming meeting?
5. How should the area manager respond? The data processing manager?
6. How might the computer system be modified to alleviate his concerns? Should the company change its policies? Training procedures?

APPENDICES:

CANADIAN AGRICULTURAL SERVICES LIMITED

APPENDIX A

Canadian Agricultural Services Limited

Computerization Objectives

The Canadian Agricultural Services Limited was a diversified agri-business concern with annual revenues of over $1 billion. It operated 160 licensed elevators throughout the prairie provinces as well as terminal elevators in Thunder Bay. On average the company handled about 10% of the prairie grain crop in any given year. In addition, it was a substantial supplier of seeds, livestock feeds, fertilizer and agricultural chemicals to the grain industry.

Computerization was part of Canadian Agricultural Services' strategy to increase its market share as an efficient supplier of agricultural services. Current plans called for the company to place computers in over 130 of its grain elevators by the end of 1985. The objectives of this computerization program were as follows:

1. Faster and more accurate entry of data in country elevators to reduce paper work plus the possibility of error.

2. Fast, accurate transmission of information to the Canadian Wheat Board on Board grain purchases.

3. Fast, accurate transmission of information to grain merchants and traders in non-Board grains, allowing them a better opportunity to hedge and trade on the company's position in the country.

4. Speedup of operations and reductions of error margins in head office processing of grain transactions.

5. More accurate information on the company's inventory position. This should help the company handle more grain and sell more farm supplies with fewer country elevators.

6. The use of information as a strategic managerial tool for planning and decision-making.

APPENDIX B

Sam Melville, Data Processing Manager,

Canadian Agricultural Services Limited - Statement of Objectives.

"Our goal in the computerization program is to achieve the right balance between the need to obtain the maximum predictability and control over our operations and the need for enough flexibility to enable us to adapt to market forces. This is done through a policy of flexibility within set limits. An example of this would be the limits we set for discounts on farm supply sales or premiums on grain purchases.

Our system can handle anything within these limits. Anything outside them requires special permission and manual processing. We expect to extend this system by the end of the year to place limits on credit issued to producers and also to handle special crops such as corn or sunflower. If all works well, our need for control will mesh with our elevator managers' need to have sufficient flexibility to be competitive in the country."

APPENDIX C

Dale Jenner, Human Resources Manager

Canadian Agricultural Services Limited. Statement of Objectives.

"Over the last decade the job of the elevator manager has changed dramatically. Essentially it has changed from a traditional craft with an emphasis on the ability to grade grain, to a more responsible managerial position combining grain purchases, farm supply sales, plus the ability to run a fairly large operation with about 4-5 employees. The old elevator agent has been transformed into the newer concept of the elevator manager.

Computerization has enabled us to put the role of the elevator manager on a more professional and business-like basis. For instance, the annual profit and loss statement provides a basis to assess the performance of elevator managers using computer-generated information on grain handling and farm supply sales. On the job training is increasingly supplemented by formal courses in computer applications and we are actively recruiting university and college graduates for our country elevator staff.

This is a very traditional industry and resistance to the use of computers can be strong by those who are unfamiliar or afraid of them. On the whole we think our training programs are effective but there are always a few -- a minority -- who are slow to get the hang of things.

We recognize that not all the programs we put on the computer will work out effectively in country elevator situations. That is why our computerization program must be user driven. We consult regularly with our elevator managers and staff who provide us with feedback on our programs in the field. This is an ongoing program which is vitally necessary as more and more of our operations are placed on the computer."

TEACHING NOTE & PRACTITIONER GUIDE

CANADIAN AGRICULTURAL SERVICES LIMITED

CANADIAN AGRICULTURAL SERVICES LIMITED

Teaching Note and Practitioner Guide

The purpose of this case study is to focus the student's attention on how the implementation of a distributed computer system can create conflicts between head office staff involved in planning, accounting and inventory control, and line personnel in the field who are responsible for carrying on the day-to-day activities of the company. In this case, the computer system brought with it standardization and control procedures which enhanced head office accounting but which were perceived to interfere with an elevator manager's autonomy. This can be related to broader questions in many industries today where the widespread use of distributed computing systems may be altering the position of middle managers in the corporate chain of command.

Bill Reinfeld's dissatisfaction may also be a product of the craft-like training and sense of responsibility and autonomy associated with the individual elevator manager. Such an outlook may have been necessary when the grain elevator was an isolated outpost on the prairies, but is it appropriate today? Should the training of elevator managers be modified to reflect a new era of tighter administrative monitoring of their performance? What, however, are the dangers of taking this approach?

The purpose of the questions at the end of the case is to make the student aware that the organization of the future may require both the tighter controls associated with computerized efficiency and the flexibility associated with individual initiative and responsibility. These concerns should be raised in an ongoing consultative process which should accompany the introduction of new technology.

Was the consultative process at Canadian Agricultural Services sufficient to deal with Bill Reinfeld's concerns? Why did Bill avoid using the computer? How should Bill present his case to the area and data processing managers to increase the chances that his concerns will be taken seriously?

These questions should also emphasize that computer-communications systems do not eliminate the need for the kinds of consultation processes that are only possible in face to face meetings.

Case Analysis

Canadian Agricultural Services Limited is a case study which illustrates how the implementation of a distributed computer system created conflicts between head office staff involved in planning and control and middle managers in the field. The computer system was accompanied by increased standardization and control procedures and stepped up monitoring of the performance of line elevator staff. These procedures reduced the autonomy of the elevator manager to perform operations and deal with customers his own way. This loss of autonomy was resented. In addition, the elevator manager was concerned that his operations were hampered by cumbersome procedures and periodic computer downtime.

He also believed that the computer was of little assistance to him in carrying out his tasks, and was mainly designed to assist head office in performing accounting and monitoring procedures. For this reason he avoided computer use whenever possible, preferring to leave its operation to his secretary. She in turn, complained about the slow pace of operations and cumbersome procedures, and tried to devise ways to speed up her rate of data entry.

Another problem was that the standardization and control procedures involved in computerization conflicted with the independent outlook of the elevator manager. His orientation and training was individualistic and entrepreneurial. He did not like the idea of having to conform to standard procedures dictated by a computer program. A forthright man, he was determined to communicate his views to his area manager and to head office. He was optimistic that his views would be taken into consideration.

Corporate policy was flexible and allowed for considerable discussion about computer problems among elevator managers, area managers, and head office accounting staff. In addition, a special "computer help line" was established so that elevator staff could phone in their data processing concerns. These policies promoted corporate integration by allowing communication and discussion within the company. Equally important, they provided needed feedback on the effectiveness of particular software programs.

The computer system can be modified to simplify procedures and speed up operators. Also, flexibility can be built into the system giving the elevator manager certain degrees of freedom in pricing and marketing grain and farm supplies within acceptable limits. This balances the elevator managers need for autonomy with the need for head office controls on accounting and marketing. Such a solution would be acceptable in this case.

It is doubtful that a wholesale revamping of corporate training policy would be justified. It is in the company's best interest to feature elevator managers whose outlook is entrepreneurial and managerial, able to assess local markets and make competitive decisions. Designing computer networks to reflect this behavioral reality is more appropriate than misguided efforts to modify the latter to suit the former.

Postscript

Canadian Agricultural Services Limited developed a number of strategies in order to resolve computer-related problems. First, all elevator managers were given comprehensive training in computer applications for country elevators. The value of this training was reduced, however, by the tendency to rely on a secretary to operate the system. This pattern can also be found in many other industries.

Second, regular consultations were conducted among elevator managers, district managers, and head office staff involved in the computerization program. These consultations were designed to reduce stress and start-up problems associated with computerization. They also provided a feedback mechanism under which the utility of various computer programs could be tested against actual field experience and, if necessary, modified to better meet user needs. As well, consultation on computer problems promoted corporate integration by giving elevator managers a sense that they would be heard.

Finally, computer programs were developed to ensure flexibility within certain parameters to enable elevator managers to adapt to changing competitive conditions in the country. Grain and farm supply prices could be raised and lowered, within limits, in order to meet the competition. If necessary, even these limits could be overridden with the approval of the district managers. These more flexible controls were an effective compromise between the desire of the head office for standardized procedures and the elevator manager's need to adapt to a changing business environment.

Section 3

CASE STUDY:
PRAIRIE GRAIN PRODUCERS

PRAIRIE GRAIN PRODUCERS[1]

In May, 1985, Archie Buchanan, Manager of the Computer Programming Department (CPD) of the Prairie Grain Producers, found himself increasingly frustrated and unable to cope with the many requests for programming services from the company's operating departments. This frustration became most critically evident during an 18-month pilot project to automate the administrative and marketing functions of the company's rural grain elevators.

Archie was pressured with requests from other department managers to evaluate current administrative and operational procedures and to develop software that would standardize those procedures. His evaluation of suitable computer applications led to a re-evaluation of existing corporate policy. Archie found himself undertaking corporate level analysis of policy from the perspective of middle management. He was unhappy in this role and sought a clear definition of responsibility for decision making.

Archie understood the procedures and their suitability for automation. However, as manager of the Computer Programming Department (CPD), he was not familiar with the company policies which ultimately dictated the procedures for automation. In Archie's opinion: "...we (CPD) are often thrust willy-nilly into decision making without the advantage of an overall company frame of reference."

Company Background

The Prairie Grain Producers (PGP) was a farmer-owned grain marketing company and an integral part of the history of the grain industry in Western Canada. For over half a century the PGP has served farmers in the province of Manitoba. These farmers were shareholders of the cooperative and, as of 1984, the PGP supported a membership of 18,225.

The business of the cooperative was conducted by a Board of Directors who acted in accordance with policy guidelines established by a delegate body numbering 82 and the provincial board consisting of 10 directors.

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[1] This case was prepared by Alana McKenzie under the supervision of Professor Joel Novek of the Sociology Department, University of Winnipeg, as a basis for classroom discussion rather than to illustrate either effective or ineffective handling of an administrative situation. This material is the property of The Technology Division, Manitoba Department of Industry, Trade, and Technology.

The overall objective of the PGP was to secure a large enough share of the grain market to realize financial success and to ensure its long-term future as an institution. And yet it had to promote cooperative endeavors which would foster the success of its members, even if they were only of marginal economic benefit to the company.

A large part of PGP business was conducted through an extensive network of rural elevators. This elevator network functioned for four reasons: (1) to provide storage facilities for numerous varieties of grains, seeds, and specialty crops; (2) to ship grain to the coastal terminals in cooperation with the national railway system and the Grain Transportation Authority; (3) to upgrade the quality of stocks by blending the various grades of grains in storage; and (4) to retail farm supplies (seeds, chemicals, and fertilizers) to its members.

The elevators were staffed by one to four persons depending on the buying and selling activity of the elevator. The elevator manager was responsible for the success of his business; however, he was not autonomous in setting policy or dictating operational procedures. He had to react to the directives of the area office and head office.

The head office consisted of several departments, each with specific mandates, to provide particular services on behalf of the cooperative. The departments of Construction and Maintenance, Grain and Seed Sales, Livestock, Chemical and Farm Supplies, Personnel, and Coastal Terminal Relations had requested that the CPD devise a system for communication between those head office departments and the country elevators (Exhibit 1). In response to these requests, Archie had been given the mandate to devise a computer network which would monitor daily activity in the country elevators and provide administrative standards and procedural guidelines for elevator managers.

Goals and Objectives of the Computer Programming Department

The CPD administered PGP's computer communications network. The CPD collected information on grain sales and storage, as well as farm supplies inventory. In turn, the CPD delivered pricing schedules on chemicals and fertilizers, a cash ticket printout for grain sales, receipt printouts for farm supply sales, and in general provided a communications network linking head office with all the rural operations. The system for collection was a network of remote micro computers at country elevators linked to a centralized mainframe, located at head office.

CPD needed hardware that was simple to operate and yet reasonably complex in capability to process a variety of software programs. The diversity of the grain industry, the low level of skill of the user operator, and the remoteness of the computers from head office meant that the CPD had to choose microcomputers that were "user friendly" and easily serviced. The grain industry was very regulated and the number and variety of documents required to meet the needs of the Grain Transportation Authority, the Canadian Wheat Board, and The Canadian Grain Commission was extensive (Exhibits 2 & 3).

Whenever a policy change or a regulation update dictated a new form, the CPD adjusted software, distributed a new diskette, and created a new or updated format for the system.

Along with the purchase of suitable hardware, the CPD had been involved in the ongoing process of developing software programs to meet the very specific needs of the grain industry. Archie stated that:

> Timing, accuracy and completeness of the information is important in such a highly-regulated industry. Elevators aren't highly staffed with clerical people and the work is seasonal. Sometimes they're (elevators) almost deserted, and sometimes farmers' trucks are lined up for some distance.

By 1985, 81 of the company's 160 elevators had computers with limited on-site processing capabilities. The short-term goal of equipping rural elevators with micro computers was in its final stages of completion. However, the CPD's long-term goals were still to be realized. Archie expanded on these long-range goals.

> We wanted to implement on-site data collection and transaction generation activity, provide more information for the staff managing the elevator operations, and improve data communications between the elevators and head office.

He added that the CPD responded to the needs and requests of all levels of PGP management. The goal of the CPD was to develop software that would further automate the administrative and operational tasks of each department within the cooperative structure. Archie stated that the most immediate goal for the CPD was to "set up objectives for a computer at the outset, and then carry them through."

The Process for Evaluating an Automation Procedure

The CPD was capable of devising software for most procedures that were relevant to the management of rural elevator. "Functional" or "operational" tasks such as accounting, pricing, equipment monitoring, security, and communication networks were samples of procedures which could be programmed into a computer. When a request to automate a particular transaction was received from one of the other departments within the cooperative structure, the CPD proceeded with a "developmental mode" of action which was intended to isolate inconsistencies in software before it was applied to a particular department's needs.

The feedback stage of the developmental mode was critical. It was important for the CPD to first clearly understand the nature and specifics of the user's request. It would then outline inconsistencies and obstacles that might exist in programming or equipment. Requests would be redefined, but significant policy decisions would often be required to dictate required procedures.

In an attempt to eliminate some of the programming difficulties, the CPD consulted with all related departments, agencies, and users to ensure that its "functional design" (pilot software) was an accurate reflection of the initial request. Archie had evaluated functional designs and found that "they (other PGP departments) find the software is not consistent (with the policy)...and then CPD has to go all the way back to the user to clarify." When Archie examined policy inconsistencies, he commented, "...clarification discussions would be with the person responsible for that function ... for example, the manager in charge of marketing chemicals, would examine procedural flaws in the return policy."

In an attempt to eliminate the frustrations of programming software for procedures which are discretionary by nature and thus are not suitable for adaptation to the computer, Archie corresponded with the management of other departments and educated them to the capabilities of the computer and his department. The CPD educated and facilitated other PGP departments and also retrieved an evaluation of functional designs so "they (CPD) know if the programmed sequence of events they have created is effectively simulating the business procedure that they have been called to automate."

The development of software programs was a delicate process. After a final detailed evaluation of the "functional" design, the CPD progressed to a more detailed design level. After further monitoring the user's needs and satisfaction with the initial program, the final software product was issued to the elevator managers. "When a procedure is automated, there is little option for people to deviate from that set of procedures and so...(CPD) always does a user test before anything is finalized."

The Design of Software for Grain Handling Versus Farm Supplies Sales

It was not difficult to design software for the administration of grain handling because it was a highly regulated activity in which grain purchase price and delivery quotas are set annually by the Canadian Wheat Board. The elevator manager bought, sold, and shipped grain stocks within the constraints of specific guidelines. Therefore, the monitoring of daily activity was an easily automated task. There were few situations in which the elevator manager had discretionary power in the decisions or actions he exercised.

However, this was not the case with PGP's rapidly growing sales of farm supplies such as seed, fertilizer, and chemicals. The policy regulating sale of farm supplies was set within the PGP organization responding to market forces. The software did not reflect the continuing changes in procedure and guidelines affecting pricing, discounting, and, to a certain extent, inventory records.

The objectives of the Farm Supplies Department stated its readiness to adjust procedures, price controls, and selling patterns to compete with other grain companies and chemical distributors. Their innovatives sales and dividend program required that flexible controls be built into a software program, which ultimately responded to environmental and market conditions.

The intent of such a policy was to provide its cooperative membership with financial benefits. When a policy/procedure that could not be easily standardized for automation was encountered, Archie and the CPD negotiated with the user (elevator managers) and the policy makers (corporate management and Board of Directors) to adapt procedures and policy to market realities. On several occasions Archie found that "...it was necessary that there be some high-level rethinking...of company goals and philosophy."

A Summary of Archie's Current Frustrations

Recently two software packages designed by the CPD to automate the accounting and receipt procedures of farm supplies sales came under scrutiny. The software developed to assist the elevator manager to process farm supply sales proved ineffective in dealing with the uncertainties of market forces and human decision making.

When the automation request from Farm Supplies was evaluated it was considered by the CPD that the transactions under review could be conceptualized in terms of logical processes and therefore was adaptable to the computer's software programs. However, it turned out that the execution of the procedures was dependent on the elevator's experience and discretion.

Management decisions could not be effectively dictated by a computer program. Software provided certain guidelines for allocating priorities for the processing decisions but it was not a substitute for human judgement. Archie stated that "what they've (other PGP departments) visualized as workable, ends up not as efficient when they've (CPD) applied a technical solution."

Archie has found with the experience of the last five years that the problem was that the managers of other departments habitually assumed that the CPD's capabilities were, in fact, greater than they really were. The unrealistic interdepartmental expectations and misconceptions of computer programming had caused frustration within the CPD and had escalated the demands on Archie as department manager.

Two Examples of Farm Supplies Procedures Not Applicable to Software

The cooperative offered a discount price on chemicals after a certain minimum quantity had been purchased. A farmer could request that the elevator manager withhold records of the individual purchases until he bought enough chemical to qualify for the volume discount. The user manual provided by CPD made provisions for "transactions in process" and therefore it was technically possible to delay an entry. The process for saving and recalling transactions was a component of the software developed specifically to meet the needs of grain sales and storage, and therefore a necessary component of the microcomputer's capabilities at the rural elevator.

However, the withholding of farm sales receipts so that an individual could qualify for a discount had negative consequences. Archie provided an example of a farmer making four separate purchases of $1,000 each. The elevator manager had a certain leeway to combine the four purchases into one on the computer after the final transactions, at which point the farmer would qualify for a 20% discount. However, if the sales were processed individually, the farmer would not have made a sufficient minimum purchase to qualify for the discount. The policy of volume discounting allowed for discretionary procedures since the elevator manager did not have to report sales immediately. However, the human discretion allowed in recording the transactions inhibited the effectiveness of the software developed to administer the policy.

The ability of head office to monitor sales and inventory at an elevator site was limited. The withholding of sales information on farm supply stocks invalidated the inventory printout. The stock had been removed from the warehouse, and yet without a record of sale, the software programmed to monitor inventory was not updated. The printout of chemicals and fertilizers in stock would not represent the actual quantities in store. A series of sales transactions in abeyance could alter the validity of other date stored in the computer.

A second example of a computer procedure application which did not accomplish its original intention was the returns policy. The returns policy allowed the farmer to present a receipt for chemicals purchased in order to receive a total refund for that portion unused at the end of the season. The computer then issued a receipt. However, the procedure was thwarted in its implementation because the time and place of purchase are often unknown to the elevator manager.

The price of chemicals fluctuated a great deal from season to season, elevator to elevator, and from one grain company to the next. The quantities of chemical that were returned need not have been purchased in that same year, at that same price, nor even at the same company. The elevator manager's inability to monitor the original price, or the origin of the purchase, left the process of refunding a specific purchase price at the discretion of the farmer. Archie provided the following example: "a farmer purchasing a chemical at $80, $90, and $100 over a period of time...could return a portion of the allotment bought at $80 per unit for a refund of $100, using the sales receipt as per request..." In this way the original intent of the computer could be easily frustrated.

A Commitment to Resolve the Frustrations

The application of the volume discount and returns policies were affected by three variables. The policies had to follow the guidelines set by corporate goals, react to volatile competitive conditions, and be administered by elevator managers who exercised discretion in the application of computer programs. These were inherent limitations that had to be considered in the process of software applications for country elevators. Archie affirmed that the real dilemma was when "the user is expecting a piece of machinery to perform a human management task." Archie felt a technical solution to a management problem will never work because "the computer is not designed to take over all aspects of management." The operating environment of a country elevator was simply not conducive to the smooth technical solutions envisioned by programmers.

The process of automating a procedure involved more than just consultation with department managers to ascertain their particular needs. Archie had to become more knowledgeable of corporate objectives and operating philosophy to accurately judge the rationale of a specific policy that affected procedures to be automated. For example, Archie explained, "even if the request involves management and corporate philosophy...it is common for other departments to look to the CPD to solve their problems." However, such problems could not easily be resolved through the application of computer techniques. Rather, as Archie stated, "the bigger task may be to examine the basic principles of the PGP and the goals and objectives for which the procedures are intended to service."

In order to examine the broader principles of administration, Archie had to work outside the formal definition of his role as CPD manager. By doing this he compromised his daily routine as manager as well as his ability to carry out other automation requests of other departments. Other departments could not understand why their requests for automation were rejected and questioned the competence of CPD. Archie was over-extended in his attempt to manage, research, mediate, consult, and evaluate. Having been in his own words, "thrust willy nilly into a policy making role," he began to search for new corporate structures which would relieve his frustrations and enable him to carry out his job more effectively.

Questions for Discussion

1. What are Archie's immediate and long range goals for himself? For the CPD?
2. What are the sources of Archie's frustrations? Which ones were of the greatest significance?
3. Is there a correlation between Archie's goals and frustrations?
4. Why was it difficult for Archie to provide software for the return policy and the volume discounting?
5. Based on the scope of the case, and the examples provided, define "discretionary procedures.
6. Why is the sale and marketing of grain -- as opposed to farm supplies -- not appreciably affected by management policies?

7. Why did Archie need to negotiate a new system for evaluating software with the other PGP departments and the Board of Directors?

8. What did the other PGP departments view as the CPD's responsibility in response to procedural inadequacies.

9. Set up a flow chart of responsibilities of the new structure intended to review applications for software programs?

10. In what way does the new structure alleviate Archie's frustrations and those of other departments in the PGP?

EXHIBITS:

PRAIRIE GRAIN PRODUCERS

EXHIBIT 1

MEC CORPORATE STRUCTURE

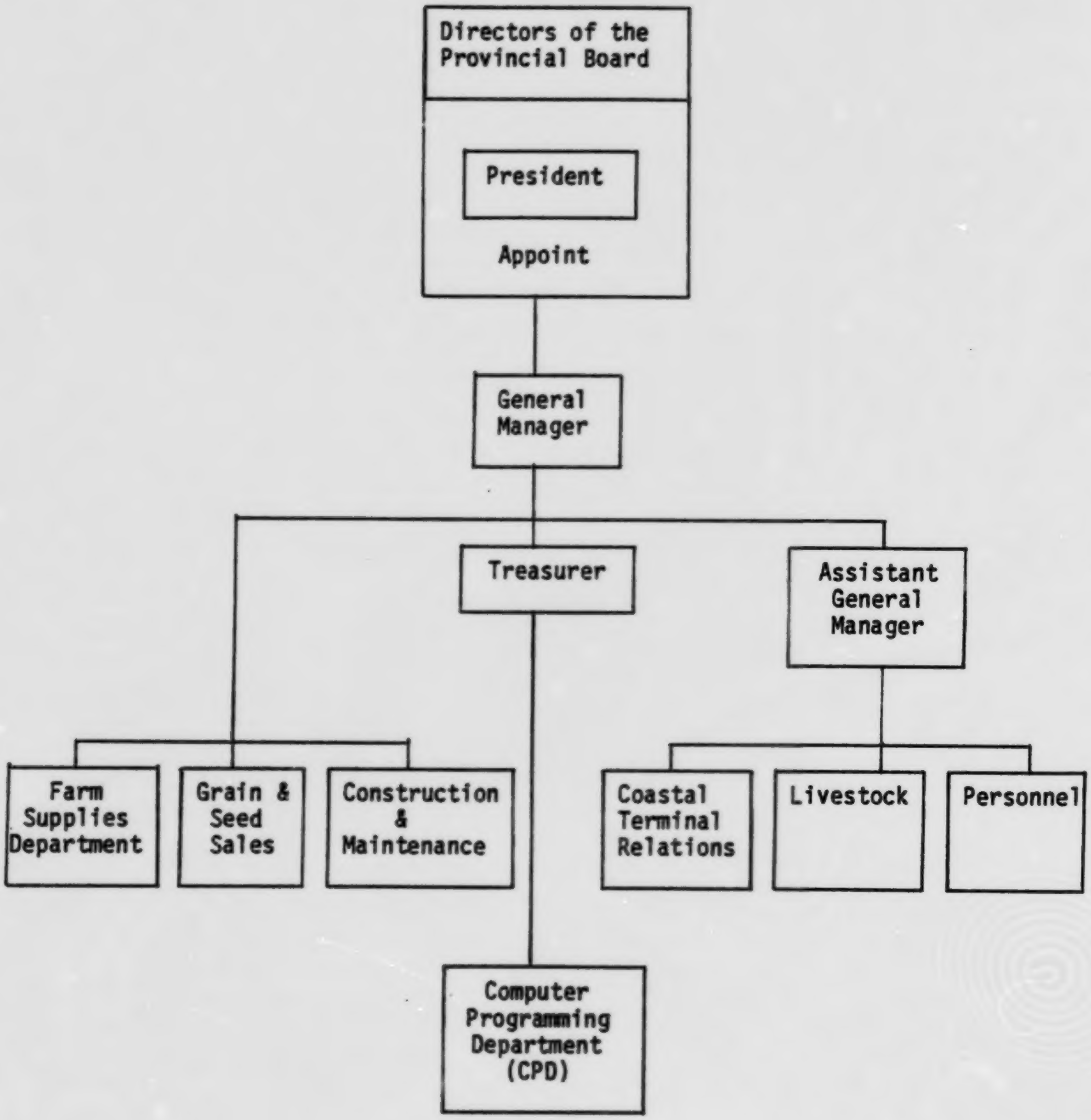

Directors of the Provincial Board
President
Appoint
General Manager
Treasurer
Assistant General Manager
Farm Supplies Department
Grain & Seed Sales
Construction & Maintenance
Coastal Terminal Relations
Livestock
Personnel
Computer Programming Department (CPD)

EXHIBIT 2

THE CPD COMPUTER SYSTEM

The CPD Computer System consists of a set of purchased equipment {hardware} and a set of computer programs {software} developed by PGP that provide:

1. Automated transaction processing facilities

2. Station management and reporting information

3. Electronic communications between head office and stations

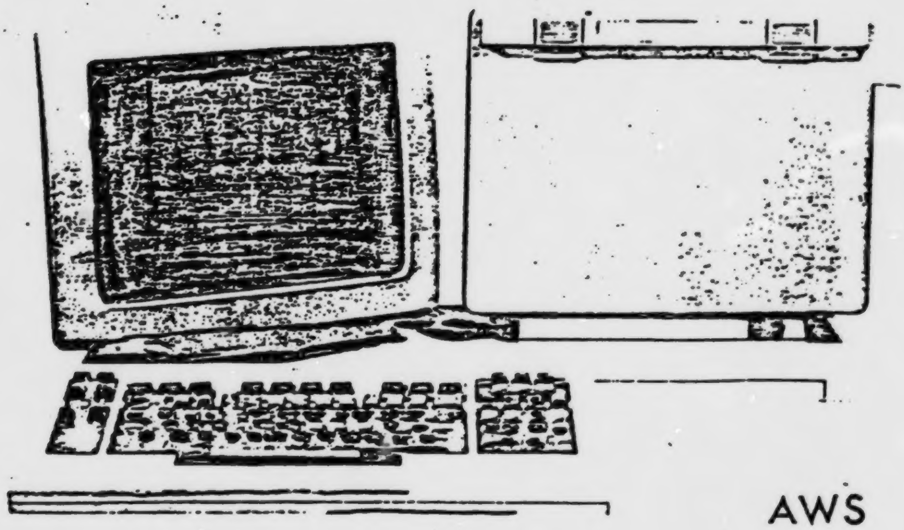
Eventually the system will encompass most of the station activities. This includes grain, farm supplies, inventories and other related transactions.

CPD SOFTWARE

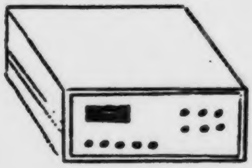
Software (programs) have been developed by PGP specifically designed to meet the needs of a station. Transactions may be processed by the computer by merely selecting a number from the main menu and entering data. Calculations are automatically performed and accuracy is ensured. The computer also provides information for the elevator manager, such as prices, past transactions, grades, etc. In the future, enhancements and new developments will be made to eventually encompass all of the station activities.

EXHIBIT 3

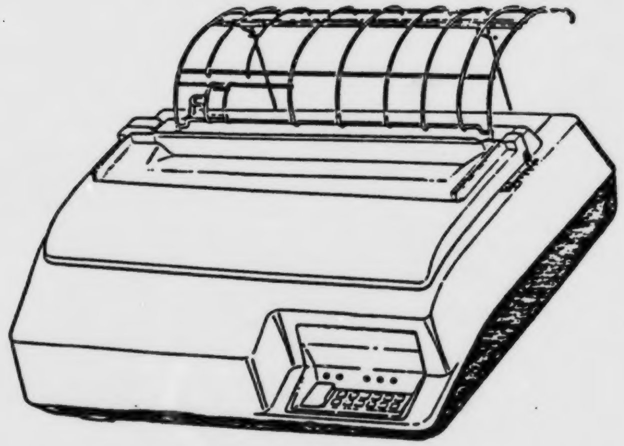
CPD HARDWARE
(An Illustration)



AWS



MODEM



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TEACHING NOTE & PRACTITIONER GUIDE:

PRAIRIE GRAIN PRODUCERS

PRAIRIE GRAIN PRODUCERS

Teaching Note and Practitioner Guide

The purpose of this case study is to make the student aware of some of the fundamental management problems involved in computerizing accounting, sales and marketing activities in a large organization; in this case an agricultural cooperative.

The case is approached primarily from the perspective of the manager of the Computer Programming Department (CPD), but the consequences of the problems involved affect the entire organization.

The questions at the end of the case will help the student isolate the difficulties, complexity, and the perspective from which Archie, the manager, evaluates the current situation.

1. As a human resource organization, the CPD is subject to heavy demands for its services from other departments in the company. This has created frustrations and stress for both the manager and the individual CPD staff members. Mechanisms and structures had to be implemented to ensure that these demands are reasonable and coordinated, in line with the overall goals of the company. Lack of such coordination was also frustrating to users of the CPD who lost faith in the abilities of the CPD and in the usefulness of the computerization process.

2. There is often a form of "tunnel vision" built into the implementation of computer programs. Procedures and ideas are evaluated to the extent that they can be programmed into a computer. If they cannot, they are apt to be assigned a lower priority or discarded, although they may be desirable in terms of the organization's goals. This is especially true in the case of a cooperative like the Prairie Grain Producers which has goals such as advancing the welfare of its members which cannot be stated solely in quantitative economic terms.

3. Inefficient and ad hoc allocation of CPD resources within the company is wasteful and probably means that the company would be unlikely to meet its overall objectives regarding computerization. CPD found itself forced to make decisions on procedures and policies that it was not qualified to make. Much time was wasted on non-productive programming requests because CPD did not have the skills to evaluate their overall usefulness and impact.

4. The programming problems surrounding volume discounting and "returns" policy illustrated the difficulties of computerization in an area where parameters are highly variable. In this example the success or failure

of the software actually dictated sales policies and practices. The problems expressed in (1, 2, and 3) became more critical in this situation as the actual philosophy of how a cooperative deals with its members became involved. Changing of procedures required changes of broad corporate policies and this must involve upper-level management.

5. Limitations of computer programs in a business environment created frustrations with the CPD and other departments who relied on it. In turn, these frustrations led to inefficient use of staff and computer time. Poorly automated operational and administrative procedures created waste and ineffective personnel. However, the automation of sales and marketing procedures could ultimately affect profit margins and the company's "bottom line." This was a far-reaching problem.

6. The elevator manager, in response to each request for a refund on returned chemicals or for a discount on volume purchases, was supposed to follow guidelines stored in computer software. However, the computer cannot legislate the reactions of the manager and police his activities. Ineffective computerization impeded the efficiency of elevator managers.

Case Analysis

Archie Buchanan's role as manager of the Computer Programming Department of the Prairie Grain Producers was to evaluate existing administrative and operational procedures and to develop software that would standardize and automate those procedures. His long range goal was to develop software suitable for the automation of accounting and marketing procedures of the company's country elevators.

The difficulty Archie faced was that in order to automate administrative and accounting procedures he had to identify those procedures and subject them to rigorous logical analysis. This forced Archie to make evaluative judgements on the effectiveness of particular company policies. It was a form of policy evaluation which Archie neither desired nor felt competent to carry out. In addition, Archie was pressured with requests for automating an increasing number of procedures from the various departments within the company. He felt that the demands on his time were beyond his capacity to satisfy.

A major difficulty was faced in the attempt to automate the accounting of farm supply sales. In this area, unlike the marketing of wheat or barley where prices are set annually by the Canadian Wheat Board, prices fluctuate considerably in response to supply and demand as well as competitive conditions in the country. The problems involved in trying to decide whether elevator managers should be allowed to offer volume discounts to big customers, or variable prices to farmers returning unused chemicals, illustrate this dilemma. One solution is to establish computer programs with discretionary procedures allowing the elevator manager to adjust prices within certain limits.

The other departments within the company expected Archie and the CPD to be able to design software which would make management decisions for them. Archie could not and this created tensions and frustrations within the company. Archie's suggested solution was the creation of two new committees, a Task and Steering Committee, designed to evaluate new software affiliations in line with established corporate goals and policies. These new structures allowed Archie to concentrate his efforts in his area of expertise; computer affiliations, with the assurance that his efforts were in line with overall corporate policy.

Postscript

Unrealistic demands had been placed on the CPD to solve policy and procedural difficulties which were actually the responsibility of other departments. The CPD could only create software to meet specific needs if the policy goals were well defined in advance. When they were not, poorly automated procedures created waste and inefficiency. As head of CPD, Archie Buchanan felt that he was unable to carry out his role effectively. Some form of resolution was required.

In the fall of 1985, Archie established two committees to assist the CPD and himself with the evaluation and implementation of new software programs. The committees represented two levels of the corporate management structure.

When the CPD was requested to develop a new program, Archie assessed the viability of automating that procedure. Based on his expertise, he produced recommendations for researching and implementing that particular program. These recommendations were sent to the Task Committee. This committee was responsible for reviewing the costs and benefits associated with the proposed computer applications. It also would oversee the implementation of programs.

If a computer application or procedure appeared to contradict overall corporate policy, or if it was more expensive than the initial budget would allow, the Task Committee referred the matter on to the higher level Steering Committee.

The Steering Committee, represented by the Board of Directors, was also involved with the "hands on" evaluation of policy. After a review of the critique provided by the middle management Task Committee, the Steering Committee was then responsible for approving substantial changes to procedures and/or expenditure.

The new evaluation structure to screen requests for automation, and make recommendations to the Board of Directors functioned on three levels. The CPD provided an initial recommendation based on technology, experience, and expertise. The Task Committee weighed the importance and impact of each proposal, and expressed the combined interests of all departments. Ultimately, the Steering Committee reflected the cooperative philosophy of PGP. A positive impetus for view of overall company policy was born out of the necessity to accurately define policies and procedures to facilitate the computerization process. Archie has expressed satisfaction that the new committee structure has enabled both himself and his department, to function more effectively.

Volume

4

THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA

A series of case studies

Vol. 4 Automation: Robotics and Office Information Systems

Manitoba
Industry, Trade
and Technology

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TABLE OF CONTENTS

Foreword 2

1 Introduction 5

2 Versatile Farm Equipment Company CAD/CAM System 7
   Case Study 8
   Figures 15
   Teaching Note & Practitioner Guide 21

3 Mid-West Garments Apparel Corporation 26
   Case Study 27
   Teaching Note & Practitioner Guide 32

4 Quality Electrical Fixtures & Supplies Ltd. 37
   Case Study 38
   Appendix 45
   Teaching Note & Practitioner Guide 63

FOREWORD

ABOUT THE SERIES

Technological change is effecting the Manitoba business community in ways only dreamed of less than a generation ago. New, modern, technological innovations are being introduced at unprecedented rates. Increasingly, continuing entrepreneurial competitiveness seems dependent on the ability and willingness of individual businesses to identify and capitalize on technological innovations, and to adapt work methods, procedures, and operations to such innovations.

Recognizing the positive challenges inherent in identifying and assimilating technology into general use, the Technology Division of the Department of Industry, Trade and Technology, and the University of Manitoba, through the Faculty of Administrative Studies, cooperatively developed a series of Manitoba-based case studies addressing the management of technological change. The purpose for this joint venture was to foster awareness of technological innovations among business practitioners and business students, as well as to assist organizations manage technological change.

The series titled "THE MANAGEMENT OF TECHNOLOGICAL CHANGE IN MANITOBA" comprises four volumes:

Vol. 1, Financing Entrepreneurial Ventures (stages, uses, & sources)
Cases: ABI Biotechnology Inc.
- financial crisis in raising development funding
- early stages of technological entrepreneurial ventures

Homestead Computer Services Ltd.
- strategies for long-term company growth: market development, new product selection
- financing long-term company growth

Vol. 2, Marketing Technological Products (processes, issues, & problems)
Cases: Sota Electronics Corporation
- developing a new technological product
- marketing a new technological product

Wintec Electronic (A)
- developing a new technological product
- reviewing R & D priorities
- marketing strategy

Wintec Electronic (B)
- production automation: analysis of marketing potential, cost effectiveness and expansion alternatives

Vol. 3, Worker Adjustment (managerial dilemmas, staff relations, and changing job functions)

Cases: Canadian Agricultural Services Limited
- impact of automation on staff relations
- impact of automation on job functions

Prairie Grain Producers
- managerial dilemmas and automation: fundamental problems and their effects on organizations from managerial perspective

Vol. 4, Automation: Robotics and Office Information Systems

Cases: Versatile Farm Equipment Company CAD/CAM System
- remaining competitive through automation
- acquiring a CAD/CAM system: factor and strategic analyses

Mid-West Garments Apparel Corporation
- reasons and conditions for considering new technologies
- importance of open-minded corporate attitudes

Quality Electrical Fixtures & Supplies Inc.
- management issues re: making effective use of information technology

The Technology Division had an editorial function in preparing these volumes

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ABOUT THE CASE STUDY METHOD

A case study is a sample of a real life situation; in this instance, a real life business situation. As a method of learning and teaching, the case study affords a unique opportunity for technological entrepreneurs, business practitioners, and business students to develop a better, perhaps fuller, understanding of a business situation which is of immediate or long-term concern to them. Through case study analysis and debate, as well as exposure to the experience and opinions of other entrepreneurs, practitioners, and students, participants learn several ways of looking at, thinking about and acting in a particular business situation. Hence, through indepth examination and diagnosis of situations comparable to their own, improved guides to action may be developed. (Reference: International Labour Office. (1972). An Introductory Course in Teaching and Training Methods for Management Development. Geneva: ILO Publications).

ABOUT THIS VOLUME

This volume comprises three case studies -- Versatile Farm Equipment Company, Mid-West Garments Apparel Corporation, and Quality Electrical Fixtures & Supplies Inc. Taken together, these three cases can be used to illustrate the conditions and factors that lead a manufacturing company into acquiring new technology in order to remain competitive. The cases also illustrate the important issues managers must cope with in making use of information technology.

The volume is primarily meant for three audiences, as follows:

1. Business practitioners seeking to improve their competitiveness in the market place.

2. Business practitioners seeking to assess how their organizations can make effective use of the bewildering array of new information technology promoted in the market place.

3. Business students who are in the process of learning about automation, particularly as it relates to robotics and to office information systems.

This volume is intended for use in a variety of settings. For example, a business entrepreneur, together with other key members in his/her organization, may elect to review the case studies as part of their decision making process regarding the company's declining competitive position in the market place. Business consultants could also use the volume as real-life subject material for technology seminars. Similarly, business educators could use the case studies to stimulate the thinking of their students.

ABOUT THE ORGANIZATION OF THIS VOLUME

This volume is organized into three major sections. Section 1 introduces the learning objectives. Section 2 presents the Versatile Farm Equipment Company case study in its entirety; Section 3 similarly presents the Mid-West Garments Apparel Corporation case study; Section 4 presents the Quality Electrical Fixtures & Supplies Ltd. case study. Each section is further divided into two parts: the case study itself including exhibits and/or appendices, and the teaching note and practitioner guide.

Section 1

INTRODUCTION TO
VOLUME 4, AUTOMATION:
ROBOTICS & OFFICE INFORMATION SYSTEMS

INTRODUCTION

Volume 4 is made up of three case studies -- Versatile Farm Equipment Company, Mid-West Garments Apparel Corporation, and Quality Electrical Fixtures & Supplies. Taken together, these three case studies can be used to illustrate the conditions and factors that influence a manufacturer to introduce new technologies into an organization. The cases can also be used to illustrate the important issues managers must cope with in making use of information technology. Versatile Farm Equipment Company describes a manufacturing firm which is concerned about its competitive position in the market place. Mid-West Garments Apparel Corporation reflects three conditions that influence a manufacturer to introduce new technologies into an organization. Quality Electrical Fixtures & Supplies Inc. describes the issues managers must address when assessing how their organizations can make effective use of the bewildering array of new information technology.

Objectives

As a package, these case studies can be used to meet the following principal objectives:

1. To describe conditions and factors that influence a company to consider the utilization of new technologies.
2. To show that the major reasons for acquiring new technologies can be varied.
3. To show that a decision to acquire new technologies can give business entrepreneurs sufficient courage to attempt to develop proprietary technology.
4. To discuss local company and larger corporate strategies for acquiring technology to improve productivity.
5. To demonstrate the importance of financial payback in the selection of technology with a large capital and operating cost.
6. To present examples of the technology that exists for CAD/CAM.
7. To discuss the importance of corporate attitudes towards new ideas.
8. To illustrate the rapidly evolving field of information processing technology.
9. To discuss the issues managers face in evaluating the wide range of information technology products available today.
10. To demonstrate the applicability of information technology to specific areas of information processing in organizations.
11. To present common implementation problems faced by organizations acquiring new information technology products.

Section 2

CASE STUDY:

VERSATILE FARM EQUIPMENT COMPANY CAD/CAM SYSTEM

VERSATILE FARM EQUIPMENT COMPANY CAD/CAM SYSTEM[1]

The management of Versatile Farm Equipment Company, a manufacturer of farm machinery, was becoming increasingly concerned with the threats being made on its competitive position in the farm equipment market place. The sources of the "challenges" included poor crop prices which affected the purchasing power of prospective customers, new entrants in the market (Japanese farm equipment manufacturers), and the relative strength of the Canadian dollar versus many foreign currencies. One strategic alternative considered by some members of management was the introduction of a "Computer-Aided Design" (CAD) and "Computer-Aided Manufacturing" (CAM) system. It was hoped that the productivity increases believed available through the introduction of CAD/CAM might return Versatile to a more profitable position in the farm machinery market.

Company Background

Versatile of Winnipeg, Manitoba was founded in 1963. At that time it was known as Versatile Manufacturing Ltd. Versatile was owned by Versatile Corporation of Canada, a large diversified company whose business interests included firms involved in oil and gas, cold storage, ship building, farm equipment manufacturing, and financial services.

The world-wide recession in 1983 resulted in the poorest financial performance in Versatile Canada's corporate history. In 1984 the Company returned to a position of positive earnings with revenues of $630 Million, a 29 percent increase from 1983. Figure 1 provides a further financial summary.

Versatile Canada - Products and Services

Versatile Canada was divided into five distinct operating groups. The Agricultural Group manufactured and marketed four-wheel drive tractors, pull-type combines, swathers, field sprayers, and specialized tillage equipment. It was also the world's leading producer of sugar cane harvesting equipment. The Cold Storage Group provided food freezing and distribution service to British Columbia, Alberta, and the state of Washington. The Financial Services Group offered retail financing and leasing services to North American purchasers of Versatile's agricultural equipment. The Industrial Group was involved in all aspects of ship building, ship repairs, overhauls and outfitting. It also provided marine design and naval engineering consulting services. The Oil and Gas Group engaged in the exploration and production of oil and natural gas. It also manufactured and sold petroleum production equipment in addition to supplying a number of services to the petroleum industry.

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[1] This case was prepared by O.B. Wolfe under the supervision of Professor Oestap Hawaleshka, Faculty of Engineering, University of Manitoba as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. This material is the property of The Technology Division, Manitoba Department Industry, Trade and Technology.

Versatile Operations

Versatile Farm Equipment Company's operations were divided into three specific areas: sales and marketing, product development, and manufacturing.

The sales and marketing function worked in coordination with a network of 700 independent dealers and distributors throughout North America. Versatile also exported its products to Australia and the Middle East.

The product development function was responsible for creating new products. Their goals were to make improvements on existing products by developing farm machinery which was more efficient, easier to operate, more reliable, and more quickly serviceable.

The manufacturing function was responsible for producing the farm equipment as well as improving production methods to increase productivity and reduce manufacturing costs.

Farm Equipment Market Conditions in 1984

North American retail farm equipment sales had dropped off dramatically in recent years. This decrease was a result of difficult times for farmers brought on by low crop prices, drought conditions, high interest rates, and falling land prices. These factors contributed to lower margins for manufacturers. Additional problems such as price discounting, over-production, and high industry-wide inventory levels, compounded the problems for farm machinery manufacturers. Exports were also affected by poor economic conditions and the strength of the Canadian dollar in the international marketplace.

Further complicating matters was the expected entry of Japanese firms into some segments of the farm machinery market. Some industry analysts also believed the Japanese could have a similar impact on the farm machinery industry as they had on the auto industry.

The combination of world-wide financial difficulties for farmers and the expectation of new, less expensive products coming onto the market resulted in prospective farm machinery buyers taking a "wait and see" attitude. This resulted in all farm equipment manufacturers attempting to maintain their market share in the face of a shrinking world market.

The CAD/CAM System

Fearing the continued bleak outlook for the farm machinery market and the possibility of new competitive threats, Versatile decided to conduct a preliminary analysis of ways to increase its productivity. The Company found that four of its major competitors had installed CAD/CAM systems as part of their strategy to improve their respective competitive positions. It was apparent to Versatile's management that further information on CAD/CAM was needed.

CAD was defined as the use of computer systems to assist in the creation, modification, analysis and/or modification of a design. It utilized a computer-graphics method of producing designs and drawings for production. Thus, it replaced the manual drafting process.

CAM was defined as the use of a computer system to plan, manage, and control the operations of a manufacturing plant. Computerized information based on CAD data could be used to directly control production machinery, production scheduling, quality control, and inventory management. The system, as a whole could improve accuracy, reduce labour needs for design and manufacturing, lessen the time required for the design and development stages, and allow for more easily understandable text and graphical presentation to customers. Figures 2, 3 and 4 illustrate the CAD/CAM process.

In its research of competing firms usage of CAD/CAM, Versatile found four competitors who were committed to advanced computer technology. The systems used by each of the companies were as follows. Deere and Company had installed nine separate "computervision" systems. About ten percent of their drawings were done by CAD. However, it was anticipated that Deere would switch to the popular IBM CADAM product. This was rumored because of weaknesses within the Computervision system and the fact that Deer's engineering department was committed to long-term use of IBM equipment.

International Harvester had used the IBM CADAM since 1978. They were expected to increase their reliance on the system on a company-wide basis. Their Agricultural Group credited the increased accuracy provided by CADAM with the improvement in their product quality and reliability.

Sperry New Holland acquired a Computervision CAD/CAM network in 1981. It had been expanded to include nineteen work stations with three separate systems, one of which was dedicated to production using CAM.

Allis Chalmers installed the "Auto-trol" system in 1982. This system used a Digital Equipment VAX computer and seven work stations. The company found the most significant benefits to be in the drafting function.

All four of the firms derived significant productivity benefits from their computer assisted operations. In general, the increased levels of productivity were reported as follows:

Drafting	4 to 1
Numerical Control Programming	4 to 1
Advanced Design Layouts	10 to 1
Electrical Schematics	6 to 1

Versatile's Computer Usage

Versatile did not have a CAD/CAM system, although it had made some use of computers in its design and manufacturing. The Design Engineering Division used external computer services to do finite element stress analysis on designs. The Manufacturing Division used external computer services for numerical control (NC) programming. An in-house Hewlett-Packard 1000 (HP 1000) was utilized by Design Engineering to run engineering analysis programs and to control an engineering prototype data base. The Bill-of-Materials was also done on the HP 1000. Finally, a Sperry-Univac mainframe computer was used for accounting, management reporting, and materials resource planning.

The CAD/CAM Investigation

Versatile Canada decided, based on its initial findings, to further investigate CAD/CAM on a corporate-wide basis. A corporate CAD/CAM Committee with representation from all operating groups was formed to analyze the costs, benefits, and strategic importance of CAD/CAM for all of Versatile Canada's companies.

The CAD/CAM committee found that Versatile was plagued with a number of problem areas, such as:

- Very poor market conditions for farm equipment products.
- A need to develop new "improved" products
- Lower productivity than many of its competitors
- Inefficient design and production methods
- Poor inventory control

The committee reported that Versatile had three strategic courses available to it:

- make no changes,
- improve operations using current methods,
- acquire a CAD/CAM system.

It was determined that both the first and second options would result in a loss of market share, poorer quality designing than competing firms, and less reliable finished products. The CAD/CAM alternative was believed to have a number of potential advantages and disadvantages.

Advantages of CAD/CAM

The benefits of the CAD/CAM to Versatile were diverse in nature and included:

a) Improved Productivity
The computer design drawing data base would allow for better management control with respect to keeping track of costs and maintaining project histories.

b) Lowered Design Manpower Growth
Versatile would be able to shift some design staff to other production and service areas. Technical publication staff levels could also be decreased.

c) Reduced New Product Development Time
Future model years products and "series" changes could be completed much more quickly. For example, International Harvester experienced a one year reduction in the development time for a particular model of diesel engines.

d) Reduced Prototype Development Costs
More design versions could be validated analytically. Therefore, fewer prototypes would be required, and less frequent component testing would be required since computer models could be constructed.

e) Reduce NC Tape Needs
NC programming could be done interactively and verified graphically. This could reduce the number of tape tries, which would free machine tools from tape proving tasks.

f) Attracting Manpower
By having state-of-the-art technology, it would be possible to attract and maintain a well-trained and specialized workforce.

Disadvantages of CAD/CAM

a) Manpower Retraining
It could take several months to have the workforce performing at a reasonably high productivity level.

b) Capital Investment
A high initial investment as well as regular monthly costs would be incurred.

c) Employee Unrest
Some employees may be unable or unwilling to make the necessary adaption; hence, some turnover may result.

While the purchase decision regarding a CAD/CAM system was still under consideration, a further investigation into possible vendors was undertaken. It was hoped that this would shed light on the actual costs and benefits which would be achieved if CAD/CAM was implemented.

The CAD/CAM committee issued a request for proposals based on the technical requirements Versatile specified. Eleven vendors responded with proposals. Seven potential supplies were put on a short-list. Finally, four vendors were evaluated with an attitude of "show us now, don't talk future development." Three of these four systems had serious shortcomings. Among the weaknesses were uninformed sales and support personnel, untested software, unclear financial future of the firm, lack of support in Winnipeg, and limited product capability.

The fourth system, the IBM CADAM CAD/CAM, appeared to meet Versatile's requirements. Among that system's important attributes were the following:

- Simplicity and ease of operation
- The system's reliability and "tested" software
- Two-dimensional design with capability for "3-D" as well
- Fast response time
- Ability to adapt and, therefore, a reduced risk of obsolescence
- Number of work stations could be expanded without replacing the central processing unit
- Good NC programming capability
- Wide user base in North America - over 200 users

The Economics of CAD/CAM

There was no doubt that the IBM CADAM system would provide significant benefits to Versatile. However, the question remained, "Did the benefits of the CAD/CAM outweigh the costs?"

There were three categories of costs associated with the purchase of the IBM product:

(1) a one-time depreciable capital cost of $1,7000,000;
(2) monthly maintenance costs of $21,904;
(3) monthly hardware and software leasing costs of $47,778.

Versatile had applied for and received a Department of Regional Industrial Expansion grant under their modernization and expansion program, and received additional contributions related to the Industrial Training Act. These grants would cover 50 percent of the initial capital costs as well as 50 percent of the monthly maintenance and leasing costs. Both the leasing and maintenance charges were expected to rise with inflation which was estimated to be about 10 percent annually. Versatile's estimated cost of capital was 14 percent.

The perceived benefits/savings Versatile would achieve with CAD/CAM based on the experience of other firms and Versatile's own analysis, were expected to be the following areas: manpower reduction, engineer change order improvements, prototype development cost reductions, reduced fix kit costs, and reduced NC machinery costs. Figure 5 provides a detailed description of anticipated savings over a five-year period should the IBM CADAM be introduced. Versatile management knew that the time had come to make a decision on the CAD/CAM. The future of the company depended on its ability to improve its position in the face of a depressed market place. Was CAD/CAM the answer?

FIGURES:

VERSATILE FARM EQUIPMENT COMPANY

FIGURE 1

VERSATILE FINANCIAL SUMMARY 1983-1984

Financial

	1984	1983
Revenue	$629.6 million	$489.3 million
Net earnings {loss}	$ 9.1 million	$(23.0) million
Earnings {loss} per Class A and Class B share	$ 0.08	$(1.17)
Capital Expenditures	$ 39.5 million	$ 14.3 million

Comparative Quarterly Earnings Results

	1984		1983	
	$ thousand	$/share	$ thousands	$/share
First Quarter	2,121	0.02	(5,407)	(0.29)
Second Quarter	2,537	0.03	(8,254)	(0.40)
Third Quarter	(1,295)	(0.11)	(10,962)	(0.50)
Fourth Quarter	5,723	0.14	1,593	0.02
	9,086	0.14	(23,030)	(1.17)

FIGURE 2 CAD/CAM DATABASE AND APPLICATIONS

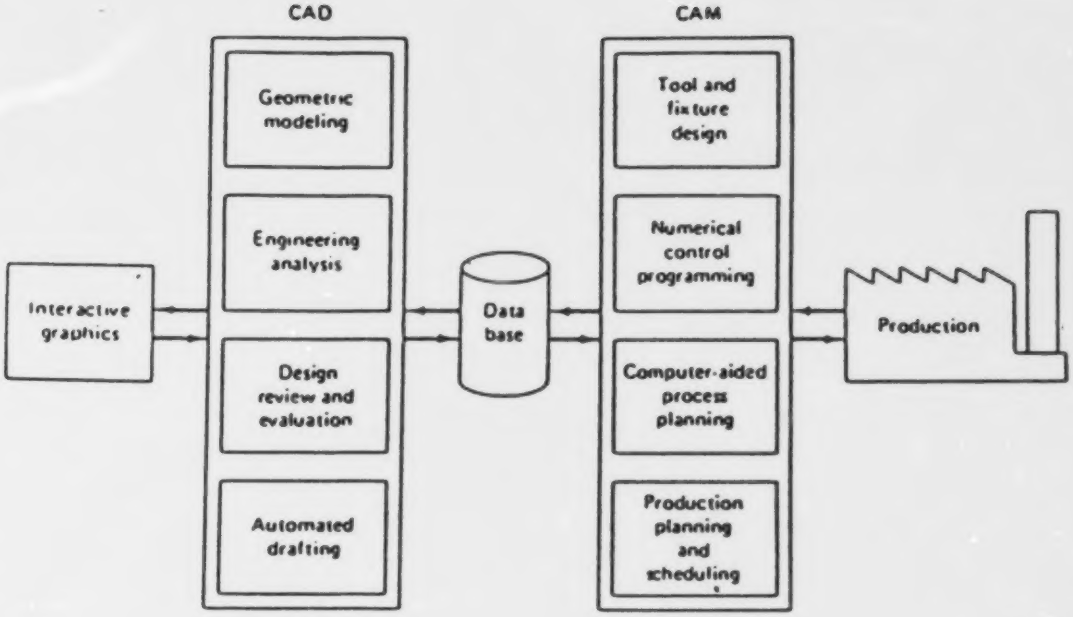
CAD
CAM
Geometric modeling
Engineering analysis
Design review and evaluation
Automated drafting
Interactive graphics
Data base
Tool and fixture design
Numerical control programming
Computer-aided process planning
Production planning and scheduling
Production

FIGURE 3 APPLICATION OF COMPUTERS TO DESIGN PROCESS

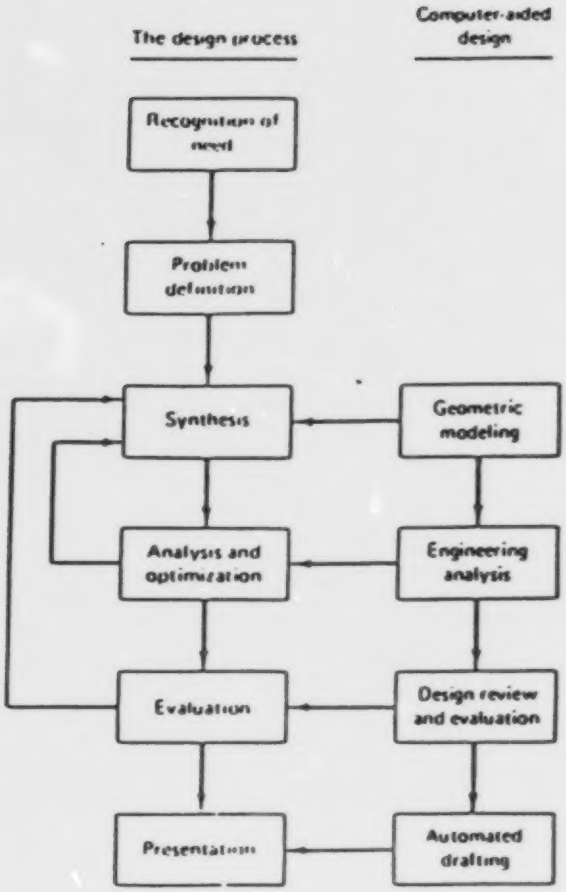
The design process
Computer-aided design
Recognition of need
Problem definition
Synthesis
Geometric modeling
Analysis and optimization
Engineering analysis
Evaluation
Design review and evaluation
Presentation
Automated drafting

FIGURE 4 PRODUCT CYCLE WITH CAD/CAM SUPPORTED TASKS

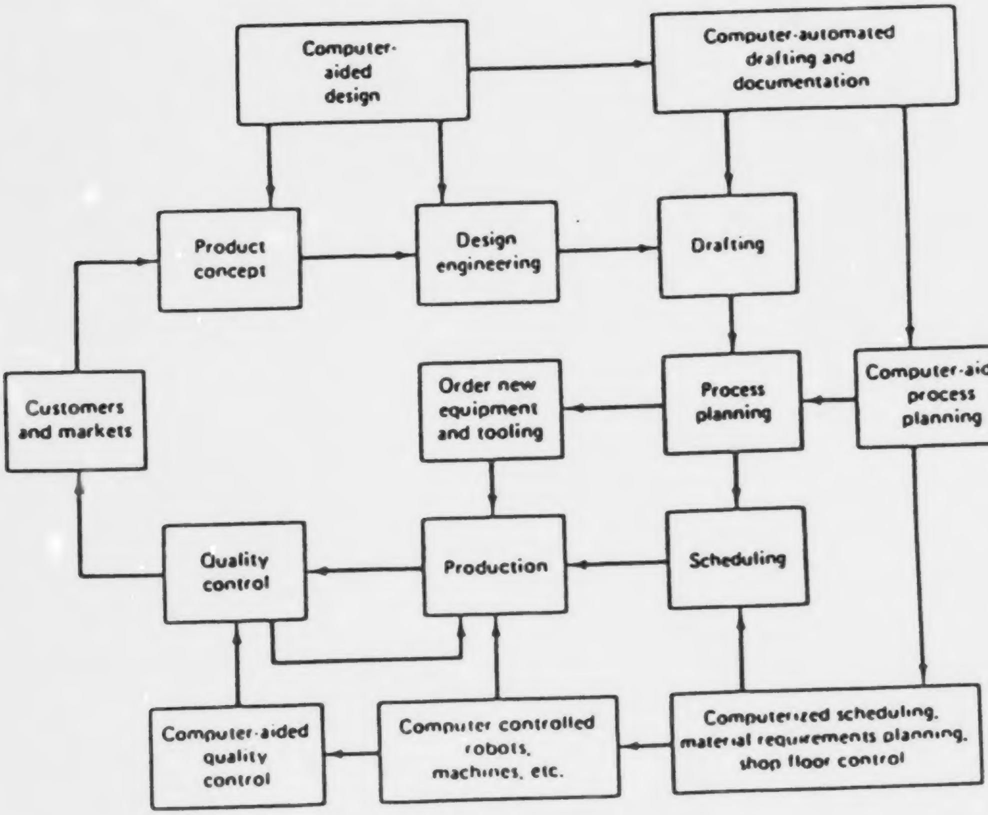
Computer-aided design
Computer-automated drafting and documentation
Product concept
Design engineering
Drafting
Customers and markets
Order new equipment and tooling
Process planning
Computer-aided process planning
Quality control
Production
Scheduling
Computer-aided quality control
Computer controlled robots, machines, etc.
Computerized scheduling, material requirements planning, shop floor control

FIGURE 5

CAD/CAM SAVINGS POTENTIAL, 1984-88

Potential Savings (000's)	1984	1985	1986	1987	1988
Manpower Reduction	$ 60.0	$300.0	$120.0	$100.0	$100.0
* Prototype Cost Reduction	60.0	97.5	130.0	130.0	100.0
** N.C. Machinery Cost Reduction	100.0	150.0	200.0	235.0	185.0
*** Engineer Change Order Savings	35.0	100.0	220.0	235.0	185.0
**** Reduced use of Fix Kits	150.0	100.0	75.0	30.0	25.0
TOTAL SAVINGS	$405.0	$747.5	$745.0	$730.0	$645.0

* Assumes the number of prototypes that can be reduced by better alternative design evaluation.

** N.C. machinery savings are a result of the need for fewer tape tries for tape proving and the elimination of machine tool tie-ups to prove tapes.

*** Engineer Change Order {ECO} savings are based on 1300 ECO's per year, at processing costs of $1000/ECO

**** Need definition of Fix Kits

TEACHING NOTE & PRACTITIONER GUIDE

VERSATILE FARM EQUIPMENT COMPANY

VERSATILE FARM EQUIPMENT COMPANY

Teaching Note and Practitioner Guide

Purposes of Case

This case illustrates the factors that force a manufacturing company into acquiring new technology in order to remain competitive. Market conditions can amplify the competitive struggle between companies trying to maintain market share in shrinking domestic and world markets. The acquisition of a Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) system could be the competitive weapon required to help the company survive. However there are numerous vendors and a wide variation in capabilities and costs of CAD/CAM systems. This case has the following objectives:

1. Illustrate the factors that force a company to initiate a program to increase competitiveness through productivity improvement.
2. Discuss local company and larger corporate strategies for acquiring technology to improve productivity.
3. Demonstrate the importance of financial payback in the selection of technology with a large capital and operating cost. Show the intangible benefits that must be included in the analysis of productivity improvements (ie. electronic information exchange between design and manufacturing engineering).
4. Present examples of the technology that exists for CAD/CAM. Also show the technological and political factors that influence the selection of CAD/CAM technology.

Overview of Contents

This case includes a background on the company, its place in Versatile Corporation of CANADA, financial status, market in which it competes, and an analysis of competitors' technology strategy. VFEC is placed in a difficult position. The demand for farm machinery is weak both domestically and abroad. VFEC's competitors in North America have years of experience in using new technology, particularly CAD/CAM to increase productivity. The case is designed to illustrate the factors that influence management decision making in all phases of the acquisition of a CAD/CAM system.

The case shows management is concerned with competing in future farm machinery markets against companies aggressively trying to improve their productivity. The company realizes that the greatest benefits can be had if all VERSATILE Corp. companies use the same CAD/CAM system. However, the choice is not easy, as the management of VFEC finds a wide variety of CAD/CAM systems on the market, with varying degrees of capabilities and costs.

VFEC's first step was to form a Corporate CAD/CAM Committee composed of members from each of Versatile Corporation's companies that could benefit from CAD/CAM. The CAD/CAM committee first looked at what VFEC's competitors in farm machinery were using for CAD/CAM. They found companies using a variety of stand-alone CAD workstations, with CAD/CAM systems running on mini as well as mainframe computers. Despite the variety, all VFEC's competitors using CAD/CAM shared one thing in common: they made improvements in productivity through CAD/CAM. On the basis of this study the CAD/CAM committee developed a list of advantages and disadvantages to CAD/CAM.

VFEC had a Sperry mainframe computer for processing accounting, management reports and Material Resources Planning. In addition, a Hewlett-Packard mini-computer was used by engineering to maintain the Bill-of-Materials for the products the company manufactured. However the engineering department also bought computer time from external time-sharing systems to do finite element stress analysis and numerical control programming. None of these applications were part of an integrated CAD/CAM system. Thus an entirely new system was required to run CAD/CAM.

While Versatile Corporation CANADA debated the decision to invest in a CAD/CAM system, VFEC issued a request for proposals based on the requirements Versatile compiled from the CAD/CAM Committee study. After much consideration the IBM CADAM system was selected from the eleven vendors who submitted proposals.

This case shows how companies must adapt to survive in markets that are becoming extremely competitive. The case also attempts to show the influence of government programs and how larger corporate strategies affect companies trying to improve productivity through the acquisition of new technology.

Suggestions for Case Analysis

This case offers many problems for analysis and discussion. Instructors who wish to focus on particular problems can draw from the following list of discussion questions:

1. Competitors
   How accurate are their stated improvements in productivity through CAD/CAM? How can you verify or justify their statements? What factors could have influenced their choice of CAD/CAM system?

2. CAD/CAM Systems
   What are the advantages and disadvantages of the three types of systems, stand-alone workstations, minicomputers, and mainframe computers (ie. cost vs. benefit)?

3. Manpower
   How should management deal with the possibility that productivity improvements will create surplus manpower? Who should be trained or retrained to use the new CAD/CAM system? Which department of VFEC should control and administer the CAD/CAM system (Engineering Services, Computer Services)? Which employee group will be most affected by the change?

4. CAD/CAM System Selection
   On what basis should the vendors' CAD/CAM systems be evaluated for VFEC's needs? How should the overall needs of Versatile Corporation relate to VFEC's requirements for CAD/CAM facilities? What problems could occur by having two major corporations supplying computers to VFEC? How should management handle these problems? What problems could occur trying to integrate the new CAD/CAM system with the existing Bill-of-Materials and Materials Resources Planning systems? What influence does the increasing power, and decreasing cost of micro-computers have on the selection of the CAD/CAM system?

5. Project Operation and Management
   Who should be on the VFEC CAD/CAM selection committee? What project objectives should project management define? What steps should project management take to reduce disruption of engineering services during the installation of the CAD/CAM system? What engineering applications should be installed first on the new CAD/CAM system?

Postscript

VFEC finally decided to buy the IBM CADAM system running on an IBM 4361-05 mainframe computer with nine graphics workstations. This system was selected over other systems for the following reasons:

1. Local support from the vendor was available.

2. Workstation operators could share common files such as standard parts through centralized files stored on the mainframe.

3. Demonstrated capability to expand from initial use of Computer-Aided Drafting to Numerical Control programming.

However the most critical factors was the superior response time offered by the mainframe based system.

In October, 1983 VFEC recommended that Versatile Corporation approve the expenditure to cover the IBM CADAM system, partially funded by a government grant from the Department of Regional Industrial Expansion and contributions from the General Industrial Training Act.

After the expenditure was approved, VFEC prepared a plan for the installation of the CAD/CAM system, new facilities and training programs and schedules for the affected staff.

VFEC first installed Computer-Aided Drafting as the initial first CAD/CAM application. Draftsmen and engineers were trained to use the new system. Based on this first application, VFEC found that operators could reach or surpass their previous manually based work capacity within 80 hours of training. Overall productivity ratios were also increased in product design, tool design, and plant layout. In some cases the productivity was 10:1 higher than previous manual methods. Productivity increases were also achieved by establishing libraries of drawing of standard parts. Designers could copy these drawings into their work instead of creating them from scratch. In addition, vendors of standard parts were encouraged to supply magnetic tapes of their parts in CADAM format.

VFEC has been happy with their decision to install CAD/CAM. Initial studies show that CAD/CAM does boost productivity and increase product quality. Through CAD/CAM, VFEC is now able to bring products to market sooner due to reduced development times. The decision to install CAD/CAM was the correct decision. IBM Corporation has used the VFEC introduction as a model example of a successful introduction of CAD/CAM technology.

Section 3

CASE STUDY:

MID-WEST GARMENTS APPAREL CORPORATION

MID-WEST GARMENTS APPAREL CORPORATION (MWG LTD)[1]

Sam Klapman, owner and president of MWG (Mid-West Garments) Apparel Corporation had a need for intricate embroidery design and implementation. The former method of creating embroidery patterns was dependent on factors which the firm could not always control. Mr. Klapman wanted complete and total control of the process because he was looking at diversifying into the promotional apparel market which relied heavily on an embroidered product. A natural progression was then to purchase Promowear Ltd., a promotional headwear and apparel company which had an established share of the nationwide promotional market. The main incentive for obtaining an applied technology system was to achieve fast turnaround of N/C (numerically controlled) tapes. In the past, these tapes were the slow critical link in the embroidery design process. Could a CAD/CAM (Computer aided design/manufacturing) system give him the freedom from outside influences he required?

Company Background

A manufacturer of garments, MWG was established in 1930. The company was a medium-sized apparel and promotional wear manufacturer employing 300 people. MWG produced garments and outergarments for all markets. Recently, a firm specializing in the promotional market (which included embroidered garments, emblems, and headwear) was purchased and the operation taken over by MWG. To keep this new part of MWG's interests operating efficiently, it was realized that total in-house control of the embroidery design process was required.

Modernization Plans

Sam Klapman envisioned a system which would give MWG in-house control of embroidery design. He knew the capabilities of present day technology but needed this power applied specifically to his problem. If a graphical representation of a design could be drawn on a computer screen and then be translated to control an embroidery machine, the problem would be solved. Now a decision was required. Should the firm search out an existing CAD/CAM system and adapt it to their needs, or finance the development of a system which could be tailor-made to solve MWG's specific environment?

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[1] This case was prepared by G.W. Klym, under the supervision of Professor O. Hawaleshka, Faculty of Engineering, University of Manitoba, as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. This material is the property of the Technology Division, Manitoba Department of Industry, Trade and Technology.

MWG had a company philosophy which dictated that any equipment will be purchased which would economically result in plant self-sustainment. Their product was high volume with many varied specific needs. If a system was developed with MWG cooperation, each of these specialized needs could be addressed. The system development would involve a substantial amount of effort, time, and a reasonable amount of money (approximately $80,000). Purchasing and adapting an existing system would involve much less time and effort but a substantially larger amount of money (approximately $200,000, plus monthly maintenance of $1000).

Embroidery Evolution at MWG

Initially, embroidery requirements of MWG were met locally and were done by hand or were contracted out for mechanized manufacture. Due to the long time frame and the level of quality, these procedures very soon became unacceptable. A small embroidery machine was purchased late in 1978. This machine worked well on one specified job after the design was developed and finalized. Any change to the design of the embroidery pattern had to be done outside MWG, which was a time consuming process. Soon this procedure also became unacceptable for the volume of different designs required. Therefore, multiple-head, N/C (numerically controlled by punched tape) machines (machines which embroider more than one unit of the product simultaneously) were purchased. This procedure worked well for a few years, but the N/C tapes were generated externally and took between 2-4 weeks from drawing and submitting of the design to the return of a tape. Any required modification consumed a similar amount of time. Recently, large area embroidery machines were purchased with the capability to place a large pattern or an array of text on a garment. Many different designs were required because MWG could now manufacture sporting jackets with team names and emblems. Many of the orders were of low volume and required quick turnaround time. The possible one month or more delay in design implementation time became unacceptable and in-house generation of N/C tapes became a requirement. The remaining choice was to buy or develop a system which would take a drawn design and create the N/C tape to control the embroidery machine. Regardless of which choice was made, consent and support for the decision was required from top management, down through engineering and the technical support staff.

CAD/CAM System Development

A search for a system began late in 1982. An examination of existing small systems revealed that they were expensive and lacked features which were required, and were not directly compatible with the present embroidery machines. The larger scale system available was ruled out as being too costly.

In June, 1983, Sam Klapman's daughter introduced her father to her employer, Brian Goldberg, of Pulse Microsystems Ltd. Pulse was a Toronto based information systems firm with a primary interest in office automation. Pulse decided to take on the development of a graphic entry, N/C tape output system to control embroidery machines. The close relationship formed between Brian Goldberg and Bill Davidson, the industrial engineer at MWG, resulted in the birth of the "Stitchwork" embroidery processor. Davidson had obtained valuable experience with IBM personal computers in his university program in industrial engineering, and possessed an understanding of the intricate details of the MWG plant and the operation of the embroidery machines. Pulse provided software expertise and the right to license existing software to prevent having to "reinvent the wheel in the system development."

The summer of 1983 was spent developing the mathematical concepts required, while actual system programming began in September, 1983. The "Stitchwork" embroidery processor was developed in the "C" programming language. A target date for completion was set for January 1, 1984 but, the unforeseen complexity of the problem delayed the completion of the first operational system to the summer of 1984. Due to delays, upper management was ready to cancel the contract and purchase a competitor's system in spring 1984. This was avoided by the enthusiasm and persistence of Bill and Brian. Two and one half years later the system is fully functional, additional user friendly features are being incorporated, and the speed of operation is being improved. The system was now so successful that Pulse sublicensed it out to a British-based apparel equipment retailer for distribution to other garment manufacturers.

The experience of the two corporations melded together to the mutual benefit of both. Originally it was thought that development costs could be covered by funds allocated by MWG, but as the complexity of the problem unfolded additional funds were provided by Pulse. They thought that development costs would be covered if they sold the embroidery processor to one other user. This was a risk they were willing to take. From Pulse's point of view, if they had known the effort required, they probably would not have attempted the development of the system. The company was still in it's youth and did not have the experience to foresee the problems which occurred.

The embroidery design systems had to meet a variety of requirements to replace the outside N/C tape design house. The system had to operate quickly and be easy to use by the system operator. This meant the implementation of an on-screen function selection menu and on-line "help" literature. The system had to be economically viable. Low initial computer costs and low maintenance costs were a priority. If a specialized system was to be developed, it was felt by all concerned that in-house development would be most cost efficient. The system used would have to interface to the already existing plant equipment. The language which the embroidery machines understood was decoded by Pulse Microsystems so the knowledge about design for selecting an appropriate interface did not exist until after the system development began. Bill knew all the features provided by the out-of-house N/C tape designer. A new system would have to include and surpass these features. Another major consideration in picking the embroidery design system was the design turnaround time. The out-of-house 2-4 week period was intolerable so a one day design time was targeted. The highest priority, however, was to get a working system in-house as soon as possible.

Once an in-house computer was installed, several additional options were considered to be desirable. First, consideration needed to be given to variables which effect the embroidery machines including: different cloth types, different thread thicknesses, and variable stitch densities. Second, modifications to the system were needed to improve the speed and ease of use of the system. Lastly, the three dimensional manipulation of any created design to allow simple design modification was implemented.

Many problems occurred specific to the computer program, the embroidery machines, and to the interface between the two end devices. These software problems were conquered as they arose by Pulse, and testing of the solution was carried out by MWG until both parties were satisfied.

Present Status

The primary MWG objective was attained: in-house control of embroidery design and implementation was a reality. Resulting by-products were also very attractive. Savings in the design process were substantial as the CAD/CAM system replaced the need for outside translation from the drawing to the N/C tape. Greater productivity resulted in reduced turn-around time to customers, more flexibility in design and, above all, in-house personnel satisfaction. Employees of MWG were pleased to see their valuable comments implemented into a CAD/CAM system which relieved them of many of the previous tedious tasks. Several employees have been working with high technology equipment which they grew to learn as the system developed. These employees then trained others on the system.

Addition features were also added to "Stitchwork". One very important feature was the reading of existing N/C tapes into the system in a reverse process. This provides MWG and all other "Stitchwork" users with the ability to use and modify (scale, rotate, etc.) their existing NC tape libraries. Another new feature was improved on-line "help" to enable new system operators to learn how to use the system more quickly and on their own. According to Bill Davidson, the feature modification and system improvement will be an on-going and never ending process.

Postscript

In looking back, the decision whether to buy an existing CAD/CAM system or to develop one, it appears that the correct decision was made. The competition consisted of two other products, one of which was on a similar scale to the one developed but with far fewer features. The other involved the purchase of a minicomputer with an approximate 3-fold cost outlay in comparison to be IBM PC/XT microcomputer which the Pulse "Stitchwork" embroidery processor uses.

The research illustrates that MWG and Pulse Microsystems will reap financial savings involved with the development of the "Stitchwork" system. Other major benefits of the development process include the great intellectual satisfaction of solving your own problem, and now a new, powerful and marketable, (approximately $20,000) Canadian developed piece of software exists. This last point was unforeseen by both MWG and Pulse and will aid both corporations technically and financially.

TEACHING NOTE & PRACTITIONER GUIDE

MID-WEST GARMENT APPAREL CORPORATION

MID-WEST GARMENTS (MWG)APPAREL CORPORATION

Teaching Note and Practitioner Guide

Purpose of the Case

This case is designed to illustrate the conditions that influence a manufacturer to introduce new technologies into an organization. It may be necessary to do so in order to improve competitiveness through productivity improvements or through better service to the client. Under certain conditions, new technologies have to be brought in simply due to the changing market demands and to keep in step with competitors. All three of these situations are reflected in this case. The occasion of the development and introduction of a CAD/CAM system (computerized embroidery) into the MWG plant is used to achieve the following objectives:

1. To describe conditions that influence a company to consider the utilization of new technologies.
2. To discuss corporate attitudes towards new ideas.
3. To show that major reasons for the acquisition of new technologies can be varied, ranging from a need to become more competitive through better pricing, to the pressure from competitors who already may have introduced such new tools, to a corporate interest in better serving the client through faster deliveries and better quality.
4. To show that the desire to be more in control of all aspects of corporate operations with minimum dependence on unpredictable sub-contractors may also be a prime driving force for obtaining new technologies.
5. To show that a decision (possibly forced by cost considerations and rapidly advancing micro-electronics) can give sufficient courage to attempt to develop proprietary technology.
6. To show how the presence of an openminded corporate owner and that of a young engineer, well-trained in modern technical systems, can contribute to the rapid development of appropriate and affordable new production systems that benefit the entire company.

Overview of Contents

The case starts with a discussion of corporate background information including the type of industry, product line, management structure, senior management personnel, market conditions and competitive environment. The situation of the company allows the demonstration of the importance of an open-minded management team in the introduction of new technologies.

The case scenario presents a profitable and expanding medium-sized apparel manufacturing firm faced with a very specific problem in achieving better results with its high-volume embroidery work. The president of the 300 employee firm had just purchased another one specializing in the promotional market (including embroidered garments, headwear and emblems). This embroidery work is in addition to the parent company's normal western wear requirements.

It becomes clear to the owner that in order to achieve appropriate turn-around times on embroidery orders and to maintain appropriate quality in terms of product as well as customer service levels, one cannot rely on outside subcontractors. Personal in-house control was required in order to achieve these points as well as the control of the technology involved. This approach was well in line with the owner's philosophy of purchasing any piece of equipment that would improve plant operation and economics.

The company already had good experience with mini-computers as all of its accounting systems were already handled in that manner. Most of their production control "tickets" were also handled by computer. The same was true for their garment labels. The company had recently introduced computerized marking systems and was seriously considering the purchase of a computerized cutting machine and was working on a computerized quality assurance system. The young, newly graduated industrial engineer was well at ease with all aspects of computer technology and was in favour of moving rapidly ahead with further modernization.

The case describes the actual embroidery problem in detail, covering the entire history of this work at MWG. It shows clearly that from the management's point of view, in order to achieve full control over that aspect of their operations, the only solution was to buy or develop a system that would take a drawn design and create the N/C tape that runs the embroidery machinery, and do it in-house.

A thorough evaluation of available systems showed that they were either too expensive, inflexible and unable to handle the type of work quality required by the firm. Due to MWG's familiarity with computer systems and due to a fortuitous meeting with Pulse Microsystems Ltd., a small and dynamic information systems firm with primary interests in office automation, it was decided to try to produce an "in-house" solution to the problem. Due to the engineer's experience with microcomputers the decision was made to base the proposed system on an IBM-XT microcomputer.

The case proceeds with the description of the problems encountered during this development process and how they were overcome. A thorough discussion of the major parameters (cloth type, threat differences, stitch densities, stitch directions, machinery interfaces) that had to be satisfied by the proposed embroidery system is given, with particular emphasis on its ease of use. Particular attention is given to the continuous close cooperation between the consultants and MWG staff in identifying problems and in working out appropriate solutions.

After nearly one year of effort success was achieved and the "Stitchwork" embroidery processor was launched. Except for minor problems it satisfied all of MWG's requirements of ease of use, quick turnaround, quality level and cost. In fact, Pulse Microsystems is now marketing the new embroidery system commercially with considerable success. Needless to say, MWG's management was delighted with the success of this work. Their involvement in it and familiarity with its development process gives them confidence for further work in related areas.

The case closes with a discussion of on-going developments and future plans for both in-house as well as commercial applications of the new embroidery technology.

Case Analysis

This case allows the discussion of several interesting problems of importance to many small-to-medium manufacturing firms. Instructors may choose from the following list of possible discussion areas:

1. Competitive Forces
   How do competitive market forces influence actions of a manufacturing firm? What are typical actions that competitors might take? How about reactions to general changes in consumer tastes and rapid technological developments?

2. Corporate Attitudes
   In what way can the attitude of the corporate decision-maker affect the development of a company? What about his receptivity to new ideas? Is he willing to introduce new equipment? What are the attitudes to economic return? Are they short-term or long-term oriented? Is the decision-maker moving with the times?

3. In-House Knowledge
   Does the degree of receptiveness to new ideas (equipment and technologies) depend on the knowledge and general training/education of the technical managers of the plant? Or, is it simply a function of the chief executive's attitude? Did the recently hired Industrial Engineering graduate's training and familiarity with modern microcomputer systems have anything to do with the progress of this case?

4. Corporate Needs
   How did the company identify what the actual problems were in the embroidery area? Did it do a good analysis of the situation? Was this analysis affected by corporate attitudes? What were the rationalizations that led to the identification of the major boundary conditions that had to be met by the new technology?

5. Relationship with Consultants
   Was the consultant selected in a rational manner? How would you do it? Once the project got underway did the company work with the consultants in developing the new technology? If not, why not? If yes, how? Was the relationship between the client and the consultant one of trust?

6. Appropriate Computer Systems
   What was the reason for the selection of a micro-computer-based system rather than one based on a mini-computer? In this day of rapidly

advancing technologies, is it better to have a centralized computer system or one that is decentralized or "distributed"? Why?

7. Project Implementation
What problems were identified during the development stages? How did they affect the design of the new system? Once the system was established, were there any training problems with the introduction of this new technology? Did the fact that it was an off-the-shelf microcomputer-based system have anything to do with it?

8. Serendipitous Results
Were the results of this case strictly limited to the introduction of a new technology for the sole use of the company? What does this experience indicate from the point of view of developing sometimes unforeseen opportunities?

Postscript

MWG hired Pulse Microsystems to help them develop the new embroidery system rather than trying to do it on their own. They realized that although they probably did have the knowledge to do it, they did not have the time to devote to that single project. An able consultant was obviously the solution.

It is interesting to note that MWG rejected commercially available systems mainly due to their excessive cost (as most were based on older technology mini-computer systems) and general inflexibility and difficulty of adaption in order to satisfy all of MWG's stated requirements. A by-product of this decision was the development of a simple, off-the-shelf technology system that required minimal training and that was well suited for further in-house development and fine-tuning.

Special attention should be paid to the fact that, in this generally extremely very conservative industry (the Manitoba group of apparel manufacturers being a notable exception to that rule) it is the combination of a very progressive owner and chief executive who is always willing to try something new as long as some benefit accrues to his company's operations can be identified and, that of a modern, well-trained young industrial engineering technocrat who understands the opportunities as well as the pitfalls associated with new technologies, that result in this overall successful effort. It is notable that MWG's understanding of the need to provide close cooperation and support during the debugging and development stage is very often non-typical of most client/consultant relationships.

One of the most satisfying and unforeseen results for MWG as well as for Pulse Microsystems was that the system they developed could be marketed to other users, at an appropriate benefit to the creators. It showed that the decision to develop something new and appropriate could open totally unforeseen opportunities.

The development of this micro-computer-graphics-based embroidery system turned out to be an excellent CAD/CAM example of what is known as "Appropriate Technology Transfer".

Section 4

CASE STUDY:

QUALITY ELECTRICAL FIXTURES & SUPPLIES INC.

QUALITY ELECTRICAL FIXTURES & SUPPLIES INC.[1]

Introduction

Mr. Ray Knowles returned from his winter vacation in April 1986 and soon discovered that his concerns about his company, Quality Electrical Fixtures & Supplies Inc. (QEI), were well-founded. The company's overall profitability for the first quarter of 1986 had fallen by 5% as a result of depressed sales, increased costs of operations, and problems in management. He is particularly concerned about this trend because he decided during his vacation that he was going to sell the company within the next five years, retire to a warmer climate, and create educational trust funds for all of his grandchildren.

Ray is a widower and has two children and six grandchildren. His children and their spouses have no interest or special capability for taking over management of the company. Ray has had preliminary talks in the past with several companies interested in acquiring his company, but he did not previously pursue these talks seriously because he felt that the value they placed on the firm was too low.

He is certain that the company is not being managed as well as when he was active in its affairs. He attributes part of the problem to the fact that the bright young people he hired as managers over the last five years simply do not have his grasp of all intricate aspects of the company's operations. For example, none of them know all of the customer's names as he does and few know as much as he about competition in the local construction industry in Manitoba. Also, they are all spending a great deal of time working on a planned expansion of the QEI's operations to Saskatchewan and Alberta and, consequently, can only devote a portion of their attention to existing operations.

Ray, who is 61 years old, was active in QEI's management until five years ago when a heart attack forced him to reduce his involvement to half days for six months of the year. He had already begun plans to sell the company even before his illness and had started his management hiring program then. He believes that he now has to do everything possible to make the company look as attractive as possible for potential buyers. He is hoping that the firm's expansion plans will be viewed favourably as an indication of increased future profitability.

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[1] This case was prepared by Professor Kenneth W. Clowes, Faculty of Administrative Studies, University of Manitoba, as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. This material is the property of the Technology Division, Manitoba Department of Industry Trade and Technology.

He now wonders to what extent well-designed computer systems throughout the company can help the new managers better plan and control operations, including the new Saskatchewan and Alberta branches, to improve profitability. The young Controller is anxious to get new computers for the company and has been sending him computer literature throughout the winter, along with the regular monthly financial statements. The other managers are a little less enthusiastic about computerization, but agreed that computers can improve the company's profitability as long as they are properly used. However, they are concerned that they will not have a great deal of time to spend investigating computerization because of their already heavy workloads.

Ray has just met with his senior managers. All of them agreed that there should be a study of the company's data processing and management information system requirements. The Controller will be in charge of this project and will prepare a report to Ray and the other senior managers.

The data processing and management information system study will deal with all aspects of administrative and accounting data processing. It will not be limited simply to accounting systems. Ray and the other senior managers wish to know the costs and benefits of a fully modern office environment.

Company Background

QEI is a retailer, wholesaler, and contractor in the electrical fixtures, supplies, and home electrical products field in Winnipeg. It was started in 1946 by Ray Knowles and Henry Janzen who both learned the electrical trade in the Canadian armed forces during WWII. The company began as a residential and commercial building sub-contractor specializing in the electrical trades. Both Ray and Henry worked very hard during the company's first years and were successful from the start.

They began hiring construction workers in the 1950s and also started stocking electrical fixtures and supplies for the construction jobs on which they bid. Their success rate on job bids improved because they gained a reputation for reasonable prices, quality work, and an ability to meet contract deadlines. Other electrical sub-contractors began to buy fixtures and supplies from the company and Ray soon got the idea of opening a wholesale distribution location to cater to this market.

QEI became well established as one of the largest electrical contracting and wholesale supply firms in Winnipeg by the end of the 1960s. It also developed a reputation for rapid delivery, reliable service, and a wide range of inventory. Henry Janzen had to retire in the early 1960s because of poor health and Ray bought his interest in the company.

The business continued to expand during the 1960s and had over 100 employees by 1969. Ray saw an opportunity to attract retail customers and opened a retail outlet in 1965. This outlet stocked all of the company's existing products and also expanded the company into electrical consumer products. QEI's reputation helped to make this outlet an immediate success and five more outlets were added over the next 10 years.

The firm now has over 300 employees; 25 in a head office, 35 in a wholesale warehouse, 50 in retail sales, and over 200 in contract work. It owns its own head office and warehouse building and rents retail space in or near major shopping malls. Contract operations are managed from the head office.

QEI now deals in over 2,000 electrical products, all of which are stocked at the retail and wholesale level. Wholesale prices are generally 20 - 30% below retail, but make up for the lower margin for QEI in the dollar value of typical orders. The average retail sale is about $50, but a typical wholesale order is over $1,500. The firm bids on about 1,000 contracts annually and wins about 400 of these. An average contract is worth about $65,000.

Management Structure

Ray Knowles is Chairman of the Board and President of the company. He only devotes a few hours a day to the company because of his health problems. He relies heavily on his managers, his personal lawyer, and his public accounting firm for advice on business matters.

Murray Jones, the Controller, has had experience in installing computerized accounting systems and is very familiar with all major types of software for microcomputers. He has been with QEI for four years and is in charge of the present minicomputer data processing installation. He has been dealing with all the computer sales representatives who have been calling on the company and has taken several professional seminars on modern computers in business.

Peter Cooney, General Wholesale/Retail Sales Manager, joined the company three years ago after a very successful stay in a sales position with another wholesale electrical supplies firm in Toronto. Peter is a very "hands on" style of manager and spends a great deal of his time at the retail sales locations. He also spends much of his time investigating potential new locations for wholesale and retail operations in Saskatchewan and Alberta. QEI's plans are to open wholesale branches in each of Regina, Saskatoon, Edmonton, and Calgary and five retail stores in each of Saskatchewan and Alberta.

Brian Duggan, Contracting Manager, is a professional engineer and is responsible for all contract operations. He has 15 years of experience in electrical contract work in eastern Canada and has been with QEI for five years. Contract work is presently limited to Manitoba, but will be expanded to Saskatchewan and Alberta when wholesale and retail operations are expanded.

Michael Norgrove, Purchasing Manager, previously held a purchasing position with a large local construction company and has been with QEI for four years. He is noted for his shrewd bargaining ability in dealing with suppliers. He is also responsible for all negotiations for sites in Saskatchewan and Alberta for the new operations.

William Buckwold, General Manager, joined QEI two years ago after holding several senior positions in a building products franchise chain company. He led a major expansion in his previous firm that saw sales increase from $35 million to over $150 million. He too is spending a great deal of time on the expansion plans.

All of these senior managers are well aware of the tremendous advances which have taken place in the computer and communications fields. They all regard themselves as forward thinkers, but they are confused about the many developments and new products which continually appear in these fields. They are not accustomed to sophisticated computer systems and are unsure just how the new technology can help them in their jobs.

Each of these senior managers has line and staff subordinates. In sales, for example, there is a head office advertising group as well as retail store managers in each location. There are a total of 22 middle managers and supervisors.

The management style in QEI was largely centralized while Ray was active, but the wholesale and retail sales managers have been given more autonomy in the last five years. Senior management still makes major decisions on products to be handled, but middle managers are held responsible for their operations' profitability. An important part of their annual compensation is based on profit-sharing bonuses.

Ray feels that all middle and senior managers should have an opportunity to participate in the data processing and management information system study. However, he is not at all sure how this can best be accomplished. He informed Murray Jones that all managers are to be consulted in the study and be given some opportunity to voice their views on the study.

Financial Data

All three areas of QEI's operations have been profitable for many years. Sales and before-tax profits for 1984 and 1985 were as follows:

(Millions)

	SALES		PROFITS	
	1984	1985	1984	1985
Retail	$25	$30	$5	$6
Wholesale	30	37	7	8
Contracting	20	26	3	4
	$75	$93	$15	$18

Summary balance sheet information is presented below:

	1984 (Millions)	1985 (Millions)
Cash	3	2
Accounts receivable	9	14
Inventory	48	62
Current assets	60	82
Land, building, and equipment - less accumulated depreciation	50	48
Total assets	110	130
Accounts payable	25	34
Bank loan	5	8
Current liabilities	30	42
Common shares	10	10
Retained earnings	70	78
Total debt and equity	110	130

Sales and profits increased at an average rate of 25% from 1979 to 1985, in spite of increasing competition. However, inventories have increased by 28% annually during this same period. Ray Knowles is concerned that overstocking is becoming a serious problem. Also, the company's profit growth rate began to slow down in 1985 and he is concerned that this could be another danger signal about potential problems.

The planned expansion into Saskatchwan and Alberta is expected to cost over $30 million. Ray expects that about $20 million will have to be borrowed to help finance the expansion. He is hopeful that the computerization project will be viewed favourably by potential lenders.

Data Processing Background

All of QEI's data processing systems were manual until the mid 1950s. Mechanical bookkeeping machines were acquired in 1956 and replaced by electro-mechanical machines in 1964. Some of these machines are still in use today, but are virtually falling apart. The supplier no longer services this equipment and they are kept operational by using spare parts from junked machines. The machines are only being used for general ledger and payroll purposes.

The present office equipment consists of the electro-mechanical bookkeeping machines, electric typewriters, photocopiers, dictation systems, and an intercom. Many of these are quite old and will need to be replaced soon. The age and condition of this equipment is one of the factors which prompted Ray Knowles to decide to investigate new information technology at this time. He is concerned that major breakdowns in this equipment could cause major administrative problems in QEI's head office operation.

QEI acquired one of the first minicomputers developed for business data processing in 1977. The model chosen was supplied by a new company which was one of the many to enter the minicomputer market in the 1970s. The hardware configuration consists of five visual display terminals, a central processing unit with 512,000 characters of primary memory, two magnetic disc drives of 50 million characters storage capacity each, and a 300 line per minute printer.

The minicomputer vendor also supplied all application software as well as a multi-user operating system. The application software included accounts receivable, inventory, accounts payable, and job costing. This software was supplied in the form of pre-designed "packages", i.e. standardized programs written for each of these applications. The application software programs have been modified many times since the minicomputer was first installed.

The minicomputer installation usually functions properly, but is getting old and worn. Hardware breakdowns are a monthly occurrence and it is increasingly difficult to have repairs made because the vendor has not produced this particular model for three years. Also, the application software produces only detailed accounting reports and QEI's management has long wanted to get better management reports from the computer. However, it is too expensive and difficult to modify the software any further as virtually no documentation has been kept of past changes.

All of QEI's senior management agree that the existing minicomputer should be replaced. The vendor who supplied it is still in business, but has not kept pace with competitive developments in the mini and microcomputer fields. It would be relatively easy to convert all present systems to this vendor's latest minicomputer model, but this would eliminate any possibility of integrating the accounting systems with other data processing activities. It would not be possible to use detailed accounting data in other systems or with microcomputers.

Management wants to consider alternatives to upgrading the existing minicomputer to a new model offered by the same vendor, but is very uncertain about what alternatives to consider. Available alternatives include other minicomputers which can integrate with microcomputers, "local area networks" of microcomputers, and standalone microcomputers. These may be "mixed" and "matched" in many possible combinations.

Software alternatives are even more numerous. There are literally thousands of application software alternatives for accounting, spreadsheets, data base, word processing, graphics, and data communications. Each alternative for each of these purposes usually involves several special features to consider. QEI's management is baffled by the vast number of factors to consider.

The Controller began an investigation of the many computer products on the market, but is concerned that there are so many competing alternatives. He discussed his concerns with friends who work for other companies and they suggested that QEI should consider hiring computer consultants to assist in evaluating available alternatives. The Controller likes the idea of retaining consultants, but he is concerned about the high costs involved. He attended a recent seminar on microcomputers in business and received the following handouts from the instructor (see Appendix A). Senior management has given him a free hand to decide exactly how to go about investigating this issue. They have asked for a comprehensive report summarizing the major issues they should consider in identifying viable alternatives for QEI in the technology area.

Questions for Discussion

1. What are the major areas to be covered in the comprehensive report to management.
2. What specific issues are relevant in deciding on the use of consultants in this situation?
3. What advice would you give Ray on the overall objectives behind looking at the technology area for QEI?
4. How can a project of this nature be organized and conducted to help ensure that a good decision is made regarding technology for QEI?

APPENDIX:

QUALITY ELECTRICAL FIXTURES & SUPPLIES INC.

APPENDIX A

MICROCOMPUTER COURSE HANDOUTS

FEATURES TO LOOK FOR IN APPLICATION SOFTWARE

FEATURES	EXPLANATION
FUNCTIONALITY	DOES IT REALLY WORK PROPERLY?
SUITABILITY	DOES IT MEET YOUR ORGANIZATION'S REQUIREMENTS?
EASE OF USE	IS IT RELATIVELY EASY FOR STAFF TO LEARN/USE?
DOCUMENTATION	ARE THERE GOOD MANUALS? A TUTORIAL? A "HELP" FACILITY?
COMPATIBILITY	DOES IT WORK ON YOUR EXISTING COMPUTER FACILITIES?
HARDWARE REQUIREMENTS	HOW MUCH MEMORY AND DISK? WHAT PROCESSING SPEED REQUIREMENTS?
REPUTATION	HOW LONG ON THE MARKET? ANY REVIEWS? ANY OTHER USERS FOR REFERENCES?
INTEGRATION	CAN IT WORK TOGETHER WITH OTHER SOFTWARE?
VENDOR SUPPORT	CAN THE DEALER PROVIDE ANY ASSISTANCE? THE DEVELOPER? ARE THEY LIKELY TO BE STILL IN BUSINESS IN 3 - 5 YEARS?
COST	FEE COMPETITIVE? ANY "MAINTENANCE" COSTS?

MICROCOMPUTER SELECTION

CRITICAL FACTORS:

- PRICES - ALL COMPONENTS
- HARDWARE/SYSTEM SOFTWARE CAPACITY/FEATURES
- APPLICATION SOFTWARE CAPABILITIES/RELIABILITY
- LOCAL SUPPORT

PRICES:

- VERY COMPETITIVE
- CONSTANTLY DECREASING
- SOME ARE LESS OBVIOUS
- PRICE OFTEN NOT RELATED TO PERFORMANCE

HARDWARE/SYSTEM SOFTWARE:

- GET ADEQUATE "HORSEPOWER"
- ADEQUATE MAIN MEMORY
- ADEQUATE SECONDARY STORAGE
- PERIPHERALS AVAILABLE
- SYSTEM SOFTWARE FEATURES

APPLICATION SOFTWARE:

- MOST IMPORTANT INGREDIENT
- ALWAYS TEST CAPABILITIES/RELIABILITY
- SUPPORT OFTEN VERY LIMITED

MICROCOMPUTER APPLICATIONS/USES

USES	SOFTWARE REQUIREMENTS
AS AN ELECTRONIC WORKSHEET (I.E. PREPARE SCHEDULES, BUDGETS, WORKING PAPERS)	- SPREADSHEET - INTEGRATED - FINANCIAL MODEL
AS A WORD PROCESSOR (I.E. CREATE AND EDIT DOCUMENTS, CHECK SPELLING, MERGE WITH MAILING LISTS)	- WORD PROCESSING - SPELLING CHECKER - MAIL/MERGE - INTEGRATED
AS AN ACCOUNTING/BOOKEEPING SYSTEM (I.E. G/L, A/R, A/P, INV., PAYROLL)	- SPREADSHEET - ACCOUNTING - INTEGRATED
AS A COMPUTER TERMINAL TO LINK TO OTHER COMPUTERS (I.E. PUBLIC DATA BANKS, MAINFRAME DATA BASE, OTHER MICROS)	- DATA COMMUNICATIONS - ELECTRONIC MAIL - PUBLIC DATA BANKS - INTEGRATED
AS A GENERAL PURPOSE DATA STORAGE AND RETRIEVAL DEVICE	- DATA BASE - INTEGRATED
AS A GRAPHICS DISPLAY DEVICE (I.E. PREPARE CHARTS AND GRAPHS)	- GRAPHICS - INTEGRATED

MICROCOMPUTER APPLICATIONS/USES

USES	SOFTWARE REQUIREMENTS
AS A PERSONAL TIME/EXPENSE/ NOTES RECORDING DEVICE	- PERSONAL MANAGER - NOTE BOOK
AS AN AID IN SPECIAL CLERICAL/COMPUTATION SITUATIONS (E.G. TAXES, MORTGAGES, PROJECTS, STATISTICS, MODELS)	- STATISTICS - INVESTMENTS - TAXES - PERT - MODELLING
AS A GENERAL PURPOSE PROGRAMMING DEVICE (I.E. WRITE YOUR OWN PROGRAMS)	- GENERAL LANGUAGES (BASIC, COBOL) - FOURTH GENERATION LANGUAGES
AS A GENERAL PURPOSE COMPUTER-ASSISTED TRAINING DEVICE (I.E. TRAINING FOR EMPLOYEES)	- AUTHORING LANGUAGES - TUTORIALS
AS AN INDUSTRY-SPECIFIC DATA PROCESSING DEVICE (I.E. TAILORED SYSTEMS)	- PUBLIC PRACTICE - PROFESSIONALS - MANUFACTURING - MANY MORE
AS A RECREATIONAL DEVICE	- GAMES

USES OF COMPUTERS IN ORGANIZATIONS

BASIC USES:

- TRANSACTION PROCESSING/ACCOUNTING
- WORD PROCESSING
- OPERATIONS PLANNING AND CONTROL

ADVANCED USES:

- DECISION SUPPORT/MODELLING
- FORECASTING/SIMULATION
- OFFICE AUTOMATION
- MANAGEMENT INFORMATION SYSTEMS

USES OF COMPUTERS BY PROFESSIONALS/MANAGERS

BASIC USES:

- SIMPLE WORD PROCESSING, SPREADSHEETS, DATA BASE

ADVANCED USES:

- COMPLEX AND INTEGRATED WORD PROCESSING, DATA BASE, SPREADSHEETS, GRAPHICS, DATA COMMUNICATIONS

EVALUATION OF COMPUTER COSTS/BENEFITS

COMPUTER COSTS:

- MONEY FOR HARDWARE, SOFTWARE, SITE PREPARATION, SUPPLIES, TECHNICAL SUPPORT
- HUMAN COSTS FOR LEARNING, FRUSTRATION, ERROR CORRECTION
- RISKS OF EQUIPMENT BREAKDOWN, DATA LOSS, ERROR LOSSES

COMPUTER BENEFITS:

- PRODUCTIVITY IMPROVEMENTS
- COMPREHENSIVE INFORMATION BASE
- EXTENSIVE ANALYSIS OF DATA
- TIMELY AND ACCURATE INFORMATION
- GOOD ACCESS TO DATA AND INFORMATION
- IMPROVED PROFITABILITY/COST EFFECTIVENESS

PROBLEMS IN MANAGING COMPUTERS

LACK OF QUALIFIED COMPUTER STAFF

LACK OF USER UNDERSTANDING OF COMPUTER CAPABILITIES, LIMITATIONS, BASIC OPERATION

LACK OF GOOD USER INSTRUCTIONS FOR SOFTWARE

LACK OF ADEQUATE USER TRAINING

APPLICATION SOFTWARE "BUGS"

POOR SYSTEM DESIGN METHODS

INADEQUATE SECURITY PROCEDURES

INADEQUATE BACKUP PROCEDURES

POOR VENDOR SUPPORT

BEWILDERING ARRAY OF NEW PRODUCTS

RAPID TECHNOLOGICAL OBSOLESCENCE

MICROCOMPUTER VENDORS

TYPES OF MICROCOMPUTERS:

HOME - E.G. COMMODORE 64, ADAM
PROFESSIONAL - E.G. APPLE IIE, IIC
SMALL BUSINESS - E.G. IBM PC, IBM PC/XT
SUPERMICROS - E.G. IBM PC/AT, LISA

PRIMARY HARDWARE VENDORS:

IBM - PC, Portable PC, PC/XT, PC/AT

IBM Compatibles - COMPAQ, COLUMBIA, CORONA, SPERRY and many more

Apple - IIe, IIc, MacIntosh, LISA

Other - Radio Shack, Hewlitt Packard, Many more

PRIMARY SOFTWARE PRODUCTS:

OPERATING SYSTEMS (MS - DOS, CP/M, UNIX)
INTEGRATED (LOTUS 1-2-3, SYMPHONY, FRAMEWORK, ENABLE, SMART)
ACCOUNTING (PEACHWARE, ACCPAC, POLAR BEAR, THOROUGHBRED)
DATA BASE (dBase II, III, RBASE)
WORD PROCESSING (WORDSTAR, WORD, EASYWRITER)

MICROCOMPUTER COMPONENTS

PROCESSING UNIT:

DECODES AND EXECUTES PROGRAM INSTRUCTIONS
PERFORMS INPUT/OUTPUT, ARITHMETIC, LOGIC
THREE TYPES - 8, 16, AND 32 BITS

PRIMARY STORAGE/MAIN MEMORY:

STORES PROGRAMS AND DATA WHILE EXECUTING
AMOUNT OF STORAGE SPACE IS CRITICAL
TYPICAL SIZE - 128 TO 512 CHARACTERS

SECONDARY STORAGE/MASS STORAGE:

STORES PROGRAMS AND DATA NOT IN USE
MAGNETIC DISKS CURRENTLY MOST POPULAR
FLOPPY - 160 TO 1,000 "K" (THOUSAND CHARACTERS)
HARD DISK - 5 TO 40 "MEGS" (MILLION CHARACTERS)
TWO TYPES OF FLOPPIES - 3 1/2, 5 1/4 INCH

SYSTEM SOFTWARE/OPERATING SYSTEM:

"MANAGES" ALL HARDWARE OPERATIONS
PROVIDES SERVICES TO USERS (E.G. COPY FILE)
PROVIDES FOUNDATION FOR APPLICATION PROGRAMS

APPLICATION SOFTWARE:

PERFORMS DESIRED PROCESSING FUNCTIONS
MUST BE COMPATIBLE WITH HARDWARE/SYSTEM SOFTWARE
EASE OF USE IS CRITICAL
FUNCTIONALITY IS CRITICAL

EVALUATION OF MICROCOMPUTERS

HOW TO GET STARTED

ATTEND INTRODUCTORY SEMINARS FOR OVERVIEW

OBTAIN BOOKS ON MICROCOMPUTERS IN BUSINESS

BROWSE THROUGH USER-ORIENTED MAGAZINES

COMPARE ADVERTISEMENTS FOR DIFFERENT PRODUCTS IN CATEGORIES OF INTEREST TO YOU

GET DEMONSTRATIONS FROM RETAIL STORES

ASK AROUND FOR EXPERIENCES OF OTHERS

RENT A MICROCOMPUTER FOR A TRIAL PERIOD

RENT OR BORROW APPLICATION SOFTWARE

TRY OUT SPREADSHEETS, WORD PROCESSING, DATA BASE, GRAPHICS, ACCOUNTING PACKAGES

EXAMINE YOUR SITUATION FOR POTENTIAL APPLICATIONS AND PRODUCTIVITY IMPROVEMENTS

TRY OUT SAMPLE ACTUAL APPLICATIONS

ASK AN EXPERT FOR ADVICE

HOW TO EVALUATE APPLICATION SOFTWARE

READ A SELECTION OF COMPUTER MAGAZINES/BOOKS REVIEW VENDOR'S LITERATURE FOR PRODUCTS YOU ARE SERIOUSLY CONSIDERING

COMPARE THE SPECIFIC FEATURES FOR EACH VENDOR'S PRODUCT

FIND PRODUCT REVIEW IN MAGAZINES

TALK TO PRESENT USERS OF ANY PRODUCT YOU ARE SERIOUSLY CONSIDERING

ARRANGE FOR A TWO OR THREE HOUR DEMONSTRATION OF THE MOST PROMISING PRODUCTS - TRY TO SIMULATE YOUR ACTUAL OPERATING ENVIRONMENT

MAKE SURE TO TRY OUT ALL IMPORTANT FEATURES YOU ARE PARTICULARLY CONCERNED ABOUT

MAKE SURE TO IDENTIFY THE HARDWARE/SYSTEM SOFTWARE REQUIREMENTS

CHOSE THE BEST PRICE/PERFORMANCE PRODUCT

SHOP AROUND FOR THE BEST DEAL

EVALUATION OF MICROCOMPUTERS

WHAT ARE THE COSTS?

MANAGEMENT TIME TO INVESTIGATE, PLAN, SELECT, AND IMPLEMENT - TWO MAN/MONTHS

STAFF TIME TO LEARN OPERATION AND SOFTWARE - ONE MAN/MONTH PER APPLICATION

INITIAL INSTALLATION COSTS:

PROCESSOR AND MAIN MEMORY (512K), DUAL FLOPPY DISK DRIVES, VISUAL DISPLAY TERMINAL, DOT MATRIX (120 CPS) PRINTER	$4,000
HARD DISK DRIVE (20 MEGS)	3,000
INTEGRATED SOFTWARE PACKAGE (SYMPHONY, FRAMEWORK, ETC)	800
SUPPLIES (DISKS, PAPER, RIBBONS, ETC)	500
ACCOUNTING/INDUSTRY-SPECIFIC SOFTWARE	3,500
LETTER QUALITY PRINTER	1,300
DATA COMMUNICATIONS MODEM (1200 BPS)	800
EXPERT ADVICE	500

EVALUATION OF MICROCOMPUTERS

FEASIBILITY CONSIDERATIONS:

- POTENTIAL APPLICATIONS
- POTENTIAL PRODUCTIVITY IMPROVEMENTS
- VALUE OF BETTER INFORMATION
- VALUE OF BETTER REPORTS/GRAPHS
- POTENTIAL STAFF RESISTANCE
- MANAGEMENT COMMITMENT
- TOTAL COSTS

REQUIREMENTS CONSIDERATIONS:

- REQUIREMENTS FOR MAIN MEMORY
- REQUIREMENTS FOR SECONDARY STORAGE
- REQUIREMENTS FOR DATA INPUT
- REQUIREMENTS FOR SCREEN DISPLAYS
- REQUIREMENTS FOR PRINTED OUTPUTS

MANAGEMENT OF MICROCOMPUTERS

ONGOING MANAGEMENT COMMITMENT REQUIRED

MONITOR ROUTINE DAILY OPERATIONS

REVIEW COMPUTER OUTPUTS CAREFULLY

REVIEW SPREADSHEET LOGIC AND DESIGN

MAINTAIN CONTROL OVER USE OF MICRO

PROTECT MICRO AGAINST THEFT AND ENVIRONMENT

REVIEW ONGOING MICRO DEVELOPMENTS

MAINTAIN ADEQUATE BACK-UPS OF PROGRAMS AND DATA FILES

ENSURE ROUTINE MAINTENANCE OF PROCESSOR UNIT, DISK DRIVES, PRINTER

BENEFITS OF MICROCOMPUTERS

IMPROVED CLERICAL PRODUCTIVITY

IMPROVED CLERICAL ACCURACY

IMPROVED PROFESSIONAL PRODUCTIVITY

IMPROVED PROFESSIONAL ANALYSIS

BETTER INFORMATION FOR MANAGEMENT

IMPROVED INFORMATION ANALYSIS

IMPROVED CLIENT/ORGANIZATION SERVICE

IMPROVED MANAGEMENT PLANNING

FUTURE TRENDS IN MICROCOMPUTERS

MORE POWERFUL DEVICES IN SMALLER PACKAGES

COST TRENDS SHOULD FOLLOW CALCULATOR HISTORY

EASIER TO USE DEVICES

WIDER RANGE OF APPLICATIONS

"SMARTER" SOFTWARE

EVOLUTION OF ELECTRONIC/PHOTONIC? NETWORKS

"SMART" PRODUCTS

ROBOTICS

EVOLUTION OF INTERNATIONAL STANDARDS

ELECTRONIC OFFICE

IMPACT ON WORK LIFE

IMPACT ON QUALITY OF LIFE

CURRENT HARDWARE DEVELOPMENTS

MICROCOMPUTERS:

FANTASTIC PROLIFERATION IN HOMES, SCHOOLS AND BUSINESSES

ALREADY 4 GENERATIONS OF MICROS - HOME, PROFESSIONAL, SMALL BUSINESS, SUPER MICROS

VAST ARRAY OF 8 BIT (CP/M) AND 16 BIT (MS-DOS) APPLICATION SOFTWARE NOW AVAILABLE

BEING USED MAINLY FOR ACCOUNTING, SPREADSHEETS, WORD PROCESSING, DATA BASES, GRAPHICS, DATA

32 BIT (UNIX) SOFTWARE NOW COMING TO ALLOW MULTI-TASKING, MULTI-USER CAPABILITIES COMMUNICATIONS, PERSONAL PRODUCTIVITY AIDS

INPUT/OUTPUT DEVICES:

ELECTRONIC "MOUSE" (I.E. ROLL AROUND DESK)

TOUCH SCREENS (I.E. POINT TO OPTIONS)

OPTICAL CHARACTER READERS (E.G. BAR CODES)

VOICE INPUT AND OUTPUT (I.E. MICROPHONE INPUT, SPEECH OUTPUT)

TEACHING NOTE & PRACTITIONER GUIDE

QUALITY ELECTRICAL FIXTURES & SUPPLIES INC.

QUALITY ELECTRICAL FIXTURES & SUPPLIES INC.

Teaching Notes and Practitioner Guide

Purposes of Case

This case deals with many of the important issues managers must cope with in making use of information technology. The field of information technology is progressing at a staggering rate and many managers are very uncomfortable in assessing how their organizations can make effective use of the bewildering array of new products promoted in the market today. In particular, the following principal objectives for the case have been identified:

1. Illustrate the rapidly evolving field of information processing (e.g. microcomputers, computer networks, data bases, data communications, fourth generation computer software).
2. Discuss the issues managers face in evaluating the wide range of information technology products available today (e.g. economic factors, human relations considerations, technical features, support capabilities).
3. Demonstrate the applicability of information technology to specific areas of information processing in organizations (e.g. computers for accounting, marketing, administration, and decision support).
4. Present common implementation problems faced by organizations acquiring information technology products (e.g. technical bugs and setbacks, human resistance to change, lack of vendor support, operational problems).

Overview of Contents

The case includes the usual organization background information on type of products, management structure, senior management personnel, financial status, routine operations, market demand, and competition. The organization's situation is designed to demonstrate the usefulness of new information technology products for several major aspects of operations and management decision making.

The case scenario presents a profitable and growing business firm faced with a variety of problems associated with information processing. Its accounting systems are portrayed as increasingly inadequate for a growing company. The use of information technology in other areas of operations is also portrayed as lacking; only typewriters, photocopiers, bookkeeping machines, calculators, and an old minicomputer are being used.

Management is concerned about a failure to use modern information technology, but is also confused about the many vendors and products available. The firm has been inundated by squads of sales representatives, each of whom claims to have the best products for them. Mounds of promotional brochures on available products have been accumulated.

They are bewildered by the wide variation in prices of apparently similar products, but are not sure that different products are equivalent in terms of relevant functions and capacities. They know that they don't know what all the functions and capabilities of different products are and which of them are particularly important to them. They also are concerned that many vendors do not have strong local support capabilities, but are not sure how important this factor is in evaluating alternatives. They are also not sure whether they have properly identified all of the potential applications for information technology in their company.

They feel confident that information technology offers them opportunities for substantial improvements in several application areas, but are concerned that they may be missing still further opportunities in developing integrated applications. For example, they can see benefits in having the name and address data in the customer accounts receivable accounting system available for word processing applications so that promotional literature can be more efficiently sent to customers. They also see some, but not necessarily all, of the benefits in having accounting systems integrated with data base management software.

Computer hardware and software products for smaller organizations are identified and their applications are illustrated. Specific products discussed include microcomputers, local area networks, spreadsheets, data base management systems, word processing, graphics, and data communications. This discussion is particularly important because many managers lack an adequate understanding of the capabilities and limitations of computer products.

The case provides a basis to lead the company through various steps in investigating information technology. The roles of computer vendors and computer users can be discussed. This use of the case is also very important because many managers are not sure how to proceed with such an investigation. They also are often unaware of the many human relations problems related to implementing computer technology. Different types of computer impacts on clerical, supervisory, and management personnel are introduced.

Suggestions for Case Analysis

This case offers several major problems for analysis. Instructors who wish to emphasize particular problems may choose from the following list of suggested discussion questions:

1. Microcomputer software
   How might microcomputer software such as spreadsheets and data base management be of use to QEI? Who in QEI might actually interact with a microcomputer with this software? What type and amount of management training would be required to introduce QEI senior executives to spreadsheet and data base software?

2. Minicomputers/microcomputers
   What are the important similarities and differences between minicomputers and microcomputers? What role can each play in the data processing and information systems at QEI? How might minicomputers and microcomputers be integrated in QEI?

3. Project design and management
   How can QEI's management define the objectives and scope of the data processing and management information system project? What major steps are possible to define in this type of project plan? What time frame would be realistic for conducting a study of this nature?

4. Relations with consultants
   What responsibilities could consultants have in this study? What should the Controller's responsibilities be regarding the consultants? What skills should the consultants have?

5. Project implementation
   What problems may QEI have in moving from one computer to another? What kinds of staff training will have to be provided to management to allow them to take advantage of microcomputer software?

Postscript

QEI eventually decided to retain a local firm of computer consultants to assist the Controller in identifying viable technology alternatives and important factors to take into account in evaluating each alternative. The consultants helped to organize a comprehensive survey of QEI's data processing and management information requirements, available computer technology alternatives, costs and benefits of alternatives, and a recommended strategy for QEI to follow in the computer area.

This strategy included a different brand of minicomputer than QEI was then using. This minicomputer was the focal point of a network of computers for QEI's head office and retail locations. Microcomputers and Point Of Sale computer (POS) terminals were installed in each retail store. The head office minicomputer had sufficient expansion potential to allow for future requirements of the Alberta and Saskatchewan operations.

Another critical factor in QEI's decision to acquire the new minicomputer is that there were several excellent application software packages available for it. These packages included accounting, inventory control, word processing, electronic mail, data communications, spreadsheets, and data base management. It was possible for QEI to transport all of its existing computer data to the new minicomputer with almost no problems.

The consultants recommended that QEI hire a full-time computer and information system support person to manage the new computer installation and promote greater use of computers throughout the company. This person was hired and was instrumental in providing all management and clerical staff with "hands on" training in software use in the first two years of operation. This person reported to the Controller.

QEI's managers and the owner were delighted with the new computer installation. The support person turned out to be very enthusiastic and yet tactful about encouraging use of the computer in new areas. For example, the contracting manager became familiar with project management software and began to use it to better plan and control contract work. After two years, he reported to the other managers that use of this software had probably paid for the whole computer installation cost in terms of better profit margins on contract work.

This computer installation was not without some problems. Several of the supervisory staff at head office found that they were unhappy with the administrative changes required to use the new computer facilities. Some turnover and resistance was encountered in assimilating new administrative applications as a result of these human relations problems.

The owner was very happy that the new computer systems also addressed his concerns about inventory management. Inventory turnover improved by the second year of new computer system operation. He was convinced that the interest costs of financing inventories were reduced significantly simply because of better information on stock availability and turnover.